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U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDE PROGRAMS
TECHNICAL SERVICES DIVISION
Rm. EB-49, 401 M Street, S.W.
Washington, D.C. 20460

PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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75-0997. Calderbank, A. (I.C.I. Jealott's Hill Res. Stn., Bracknell, Berks, England). **Pesticides in modern agriculture.** *Inst. Food Sci. Technol. (U.K.) Proc. 7(4): 216; 1974.*

Encouraged by man's practice of devoting large areas to a single crop, pests destroy up to 1/3 of the world's food crops during growth, harvesting, and storage. During World War II, synthetic pesticides (primarily DDT) came into use as replacements for nicotine, strychnine, and arsenite in pest control. DDT was first used to control insect-borne tropical diseases and passed into widespread agricultural use after the war. Research in the 1950s and 1960s resulted in the development of a diverse range of organic pesticides for agricultural use. The public has been concerned that the widespread use of these materials might have undesirable effects on the environment; the threat has been exaggerated by the publication of dubious data and uncertainty in the interpretation of the significance of trace residues in foodstuffs, humans, and wildlife. Strict government standards make it improbable that materials likely to produce serious indirect effects could ever get into unrestricted use today. The increasing demand for food will continue to make pesticides essential. New chemicals will have to be developed to cope with new pest problems, changing farm practice, and pest resistance to existing compounds.

75-0998. Matthysse, J. G. (Entomol. Dep., Cornell Univ., Ithaca, NY 14850). **Insecticides used on dairy cattle and in dairy barns: toxicity to man and cattle, hazards to the consumer and the environment.** *J. Milk Food Technol. 37(5): 255-264; 1974.* (49 references)

Insecticides currently in use for pest control on dairy cattle (e.g., crotoxyphos, dichlorvos, naled, trichlorfon, pyrethrins and their synergists, dimethoate, fenthion, ronnel) offer little toxicity hazard to the cow, dairyman, consumer, or the environment. Pesticides that cause significant residues in the milk cannot be used on dairy cattle or in dairy barns. Since the cow rapidly excretes pesticides from her circulating blood into the milk, only pesticides which are metabolized rapidly and are safe to mammals may be used. This rules out the use of persistent pesticides such as DDT which are hazardous by magnification in the food chain. The insecticides which are most relied upon are discussed according to method of use; toxicity to cattle, laboratory rats, birds, fish and wildlife; degradation time; tolerance in milk; and hazard to the consumer. Only a small amount of these insecticides enters the soil and water following proper use on dairy farms, and their persistence is short. The degradation products present very small potentials for toxic environmental contamination.

75-0999. Yamaguchi, M. (Satte Hospital, Saitama, Japan). **[A consideration on the advantages and disadvantages of pesticides.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.) 23(4): 543; 1974.* (Japanese)

Studies on pesticide intoxication should be regarded from a combination of the macroscopic point of view and the microscopic point of view. On proceeding from the microscopic viewpoint, in order to avoid pesticide intoxication, a change in approach seemed necessary, and the position of pesticide intoxication was explored from the macroscopic viewpoint. The advantages of pesticides consist of the increase and steadiness of crop yield and freedom in selecting the growing system. The disadvantages of pesticides consist of intoxication, accumulation of pesticide residues, biological accumulation, fish toxicity, and teratogenicity, all of which affect environmental conservation. It was concluded that pesticide use is indispensable at present, and that in order to avoid the disadvantages, it is necessary to persuade the farmers and other pesticide applicators to be judicious.

75-1000. Pazderova, J.; Cikrt, M. (Clinic for Occupational Diseases, FVL-KU, Prague, Czechoslovakia). **Zdravotni problematika organickych sloucenin rtuti. [Health problems associated with organomercurials.]** *Prac. Lek. 25(6): 252-258; 1973.* (36 references) (Czech)

The increasing use of mercury has led to severe contamination of rivers and lakes. Under anaerobic conditions (eutrophic lakes), Hg is mostly insolubilized as HgS, while under aerobic conditions (oligotrophic lakes), highly toxic alkylmercury is formed, especially at low pH. In man and animals, the less toxic PhMgCl and $MeOEtHg^+$ are found mainly in the liver and kidneys, while the highly toxic MeHgCl and EtHgCl are found in the liver and in the brain; $MeHg^+$ easily crosses the blood-brain and placental barriers. $PhHg^+$ excretion is fairly rapid (50% via digestive tract, remainder mainly via urine). Elimination of alkylmercury is very slow, partly due to its high enterohepatic circulation; interruption of this circulation by administration of synthetic resins containing SH groups is under investigation. The authors have been able to increase elimination of Me_2HG by administering penicillamine. Alkylmercury compounds principally attack the central nervous system, affecting mainly the cerebral cortex (degeneration of neurons); the basal ganglia are also attacked. Demyelination in the peripheral nervous system is not authenticated. Chromosomal changes have been found in the lymphocytes of patients; genetic effects have not been proven but are suspected. In occupational exposure, PhHgCl has been found in the blood and urine, without signs of clinical intoxication. An international committee has recommended the following maximum allowable concentrations in the atmosphere of the working area: 0.05 Hg vapor/m^3, 0.10 mg PhHg/m^3; no safe limit for $MeHg^+$. The Hg concentration in the blood of exposed persons should not exceed 10 μg Hg/100 ml. Fish used for human consumption must not contain more than 0.03 mg Hg.

75-1001. Norval, E.; Butler, L. R. P. (Natl. Physical Res. Lab., CSIR, Pretoria, South Africa). **Trace metals in man's environment and their determination by atomic absorption spectroscopy.** *S. Afr. Med. J. 48(63): 2617-2626; 1974.* (129 references)

Mercury poisonings have occurred in persons eating fish contaminated by methylmercury, wheat seed which had been treated with a pesticide, and contaminated meat from hogs which had consumed mercury in waste seed grain. Methylmercury poisoning causes atrophy of the cerebellar granule cells and preferential injury to the calcerine and other cortical regions. Clinical symptoms include numbness of extremities, lips, and tongue; dysarthria; ataxia of the gait; dysphagia; deafness; and blurred vision. The compounds cross both the placental and the blood-brain barriers. One of the main sources of mercury pollution has been agricultural. However, mercury compounds for use as fungicides and seed preservatives were removed from the market in South Africa in 1974. It is argued that using only obvious neurological dysfunction tests when setting standards for daily intake is not sufficient. Consideration must be given to possible behavioral, biochemical, carcinogenic, or other subtle effects such as lowered intellectual capacity and premature senility as well as to effects detrimental to the fetus. The agricultural uses of arsenic are limited in this country to the use of arsenic compounds in cattle dips and in sprays used in the citrus industry. Chronic arsenic poisoning, whether through ingestion or inhalation, may cause disturbances of the digestive system, the blood, kidney, and nervous system. Chronic poisoning can also cause bronchitis and skin abnormalities including itching, pigmentation, and cancerous changes.

75-1002. Ishikura, H. (Examining Group for Safe Pestic., Sci. and Technol. Agency, Prime Minister's Office, Tokyo, Japan). **[Planning of technology—development of safe pesticides.]** *Shokubutsu Boeki (Plant Protect.) 29(1): 27-32; 1975.* (1 reference) (Japanese)

Technological development for the coming 5-10 years is being planned. The major items were development of rapidly degrading and non-persistent pesticides; development of harmless pesticides even if they are persistent; development of degradation-accelerating agents for pesticide residues; development of microorganisms capable of degrading pesticides; utilization of natural enemies against insect pests; synthesis and utilization of insect pheromones; development of plant virucides; and development of methods for confirmation of pesticide safety. Each item is described in detail and details of the planning are explained. The necessity for reinforcing the research and development system is emphasized.

75-1003. Leffingwell, J. T.; Spear, R. C.; Jenkins, D. (Sanit. Eng. Res. Lab., Univ. California, Berkeley, CA 94720). **The persistence of ethion and zolone residues on grape foliage in the Central Valley of California.** *Arch. Environ. Contam. Toxicol. 3(1): 40-54; 1975.* (6 references)

The hazard of serious intoxication of agricultural field workers by organophosphate insecticide residues has led to the establishment of reentry intervals in California. In the attempt to extend this concept nationally, it has been found that there is a lack of relevant field data for setting such standards. In an effort to expand knowledge of the relationship between foliar residue levels and occupational hazard, an examination of the persistence and transport of ethion, Zolone, and their oxygen analogs on grape foliage was conducted. Both dislodgeable and penetrated residues were followed for 28 days post-application for both insecticides while soil surface residues were followed for ethion only. A marked difference is seen in the decay rates of the dislodgeable vs. the penetrated residues of ethion, the dislodgeable residues decaying more quickly. This difference is not apparent for Zolone. Of particular significance to worker hazard is the finding that the oxones of both ethion and Zolone in the dislodgeable residues reach a plateau after approximately seven days and do not degrade further by day 28. (Author abstract by permission)

75-1004. Starr, R. I.; Cunningham, D. J. (Bur. Sport Fish. Wildl., Wildl. Res. Serv., Denver, CO 80225). **Leaching and degradation of 4-aminopyridine-^{14}C in several soil systems.** *Arch. Environ. Contam. Toxicol. 3(1): 72-83; 1975.* (12 references)

Leaching and degradation of 4-aminopyridine (a frightening agent for protecting grain crops from blackbirds) was studied in seven soils. Carbon-14-labeled 4-aminopyridine was strongly adsorbed onto soil colloids, with the degree of adsorption related to pH. Application of seven in. of simulated rainfall over 20 days to surface-treated alkaline soils leached 0.02% to 0.18% of the ^{14}C; radioactivity was detected in the runoff from only one of the four acidic soils. Degradation of 4-aminopyridine-^{14}C to $^{14}CO_2$ was negligible in soils incubated up to two months under anaerobic conditions. Under aerobic incubation, there was a one-week lag before extensive breakdown began. Degradation rates increased with increasing temperature and soil moisture during incubation, but soil composition had a greater influence. After three months at 30°C and 50% moisture, evolution of $^{14}CO_2$ ranged from 0.4% for a highly acidic loam (pH 4.1) to more than 50% for a lighter-textured, alkaline, loamy sand (pH 7.8); the half-life of 4-aminopyridine in soils under these test conditions ranged from 3 to more than 22 months. A theoretical scheme is presented for the degradation of 4-aminopyridine in soils. (Author abstract by permission)

75-1005. Bjerk, J. E. (Vet. Coll. Norway, Dep. Pharmacol. Toxicol., Oslo, Norway). **Residues of organochlorine insecticides and PCBs in samples of Norwegian butter 1966-1972.** *Bull. Environ. Contam. Toxicol. 12(5): 606-611; 1974.* (15 references)

Samples of Norwegian dairy and farm butter were obtained monthly during alternate years beginning in 1966 and analyzed by gas chromatography for organochlorine insecticide residues. In all cases, the annual mean DDT residue levels were less than the practical residue limit established by WHO/FAO for DDT residues in milk fat; the levels fell considerably over the course of the study. The average dieldrin concentrations remained fairly constant throughout the study; in 1972, the residues amounted to about 12% of the FAO/WHO limit. PCBs were found in the 1970 and 1972 samples. Although the concentrations did not increase, PCB residues were more common in the 1972 samples compared with the 1970 samples. The low values and uniform distribution suggest an indirect source of contamination. The differences in residue levels between farm and dairy samples were slight.

75-1006. Khan, S. U. (Res. Station, Agric. Canada, Regina, Saskatchewan, Canada). **Adsorption of linuron by montmorillonite.** *Can. J. Soil Sci. 54(2): 235-237; 1974.* (9 references)

The adsorption of linuron on montmorillonite was studied. The montmorillonite used was the less than 2 μ fraction of Wyoming bentonite. Ten mg of the sample were shaken for 24 hr at 25°C with 10 ml aqueous linuron solution in concentrations ranging from 0-20 ppm. After removal of the residue by centrifugation, the concentration of linuron in the supernatant was determined by adsorption at 248 nm. Adsorption data showed a linear relation between the amount of linuron adsorbed and the unit mass of clay. The adsorption of linuron appeared affected by the cation with which the clay was saturated, Al^{3+}, Cu^{2+}, Ni^{2+}, Mg^{2+}, or H^{+}. Results of this study indicate that adsorption of linuron on montmorillonite involves coordination of the herbicide to the exchangeable cations on the clay through the oxygen of the carbonyl group. The linuron-montmorillonite complex appears quite stable as storage for over 1 month in a desiccator did not affect the infrared spectra. Thus it seems likely that in dry soils linuron may persist as a stable complex with montmorillonite.

75-1007. Lavy, T. L.; Fenster, C. R. (Author address not given). **Herbicide breakdown in soil.** *Farm Ranch Home Quart. 20(4): 12-14; 1974.*

2,4-D will degrade in the soil during a single growing season even if it leaches beneath the plow layer. Atrazine, however, breaks down more slowly and may accumulate in subsoil or groundwater if it is allowed to leach out of the top 6 inches. The breakdown process begins when a herbicide comes into contact with the soil

and soil microorganisms. A warm, moist, productive soil environment is most favorable for both plant growth and herbicide breakdown by microorganisms. Under similar conditions, chemical breakdown, photodecomposition, and/or volatilization may occur fairly rapidly. Herbicide breakdown is also influenced by the degree to which the compound is bound to the clay and/or organic matter in the soil. Reduced numbers of soil microorganisms and lower temperatures may be major factors contributing to the reduced breakdown of atrazine at 36 inches. Management practices which will minimize atrazine leaching are important.

75-1008. Adamson, R. H.; Guarino, A. M. (Natl. Cancer Inst., NIH, Bethesda, MD). **Natural levels of DDT-related compounds and polychlorinated biphenyls (PCB's) in various marine species.** *Bull. Mt. Desert Isl. Biol. Lab. 12: 6-9; 1972.*

Chlorinated hydrocarbon residues were determined in various marine animals. The total amount of DDT-related compounds on a wet weight basis was considerably greater in the egg masses of the lobster than in the hepatopancreas. In fact, this reproductive organ accumulated 3 times more total DDT materials than the hepatopancreas. The carcass, consisting mostly of skeletal muscle, contained only .13 total ppm DDT. The values for *Fundulus*, a species relatively low in the food chain, are about the same as those values found in flounder. The average total values of DDT compounds in the eel were higher than those in the hagfish. The highest levels on a fat weight basis for total DDT materials occurred in the flounder. The next lower values occurred in the egg masses of the lobster, followed by the eels, the carcass of the lobster, and the hagfish in decreasing order. The concentration in lipid compartments may be of importance in explaining the molecular basis for some of the toxic actions of chlorinated hydrocarbons in that these materials interact with phospholipids. Analysis for polychlorinated biphenyls (PCB's) indicated that the highest values occurred in lobster egg masses with the lobster hepatopancreas and carcass also containing large amounts. The eel had 1 ppm of these materials; the hagfish, half this quantity. *Fundulus* and flounder again had comparable levels. On a fat weight basis, there was extensive concentration of PCB's. The egg masses again had the highest concentration followed by the flounder, eel, lobster carcass, and hagfish. The use of DDT/PCB ratios obtained in this study indicated that the intake of these materials for the lobster, a scavenger, is from materials contaminated more recently with PCB's than with DDT's. The DDT/PCB ratio for all other species, however, suggests simultaneous contamination by these pollutants.

75-1009. Frank, R.; Smith, E. H.; Braun, H. E.; Holdrinet, M.; McWade, J. W. (Provincial Pesticide Testing Lab., Toronto, Canada). **Organochlorine insecticides and industrial pollutants in the milk supply of the southern region of Ontario, Canada.** *J. Milk Food Technol. 38(2): 65-72; 1975.* (17 references)

In a province-wide survey conducted between 1967 and 1968, milk produced in the Southern region of Ontario had the highest residues of organochlorine insecticides in the province. In this region, 88% of the DDT and 89% of the aldrin and dieldrin sold in the province were used. In 1969-70, restrictions were placed on DDT and the cyclodiene insecticides. These restrictions were reflected in milk fat analyzed in the 1970-71 survey when DDT residues dropped 34% below the 1968-69 level. This decline continued and by 1973 the DDT residue was only 28% of the 1968-69 residues, 0.05 ppm as compared to 0.20 ppm. Dieldrin residues declined from 0.044 ppm to 0.015 ppm in the same period. Restrictions placed on heptachlor resulted in no heptachlor epoxide being detected in surveys following the restriction. Chlordane and endosulfan, used increasingly in place of the restricted organochlorine insecticides, did not turn up in milk either as the parent compound or as metabolites during either the 1970-71 or 1973 surveys.

75-1010. Franco, J. M. (Inst. Quim. Organ. Gen., Inst. Invest. Pesq., Vigo, Spain). **Niveles de residuos de plaguicidas organoclorados en especies espanolas y su relacion con el medio. [Organochlorine pesticide residues in Spanich species and their relationship with the environment.]** *Invest. Pesq. 37(1): 115-145; 1973.* (25 references) (Spanish)

Methods were developed for analyzing a variety of natural specimens for organochlorine pesticides, primarily by GLC. The levels of organochlorine pesticides observed in starlings (*Sturnus* sp.) from Spain varied according to the area of capture: those from a mountainous-forested area contained BHC isomers at 0.025 ppm, DDT and its derivatives at 0.020 ppm, and cyclodienes at 0.004 ppm. Higher levels (0.05, 0.10, and 0.006 ppm) were found for the same groups of insecticides in a more highly agricultural area. Freshwater pike, which are assumed to reflect the overall terrestrial contamination level, contained 11.4 ppm total organochlorine at Garcia Sola, 9.30 ppm at Orelana, 2.70 ppm at Buendia, and 2.10 ppm at Santillana. Analyses of mussels revealed 0.46-0.051 ppm of total organochlorine pesticides, and sardines contained 0.57-0.012 ppm of these compounds. The sampling sites on the Mediterranean showed contamination levels 3-10 times as high as those in the Atlantic-Cantabric area. Pike contained 3-6 ppm of PCB, and mussels 0.1-1 ppm. Levels in sardines generally paralleled those in mussels, but were slightly higher. Organochlorine contamination of edible species in certain cases greatly exceeded the maximum permissible limit suggested by the WHO-FAO.

75-1011. Cheung, M. W.; Biggar, J. W.* (Dep. Water Sci. Eng., Univ. California, Davis, CA 95616). **Solubility and**

molecular structure of 4-amino-3,5,6-trichloropicolinic acid in relation to pH and temperature. *J. Agric. Food Chem. 22(2): 202-206; 1974.* (24 references)

The solubility of 4-amino-3,5,6-trichloropicolinic acid (picloram) was investigated at pH 0.20, 1.10, 2.0, 2.8, 4.2, and 4,7 and at 10, 20, 30, and 40°. The p*k*a values of these temperatures and the molar heats of solubility, ΔH°sol, of picloram at these pH's are reported. Explanation is offered for the variation of solubility of picloram with equilibrium pH and temperature. Dominant structural species and equilibria involved at various pH ranges are suggested and elucidated. Infrared studies of picloram at different pH's show that the intensities of the absorption bands at 2600 and 2650 cm^{-1}, the stretching vibration of $= N^{+}H$, increase inversely with pH. Existence of a number of solid structures of picloram was suggested. The possible formation of the zwitterion and cationic species at low pH is speculated. These findings are discussed as applied to picloram absorption on soil and its potential as an environmental contaminant. Also discussed is application of the values of ΔH°sol as a correction of solubility-temperature effect on the standard enthalpy of pesticide adsorption processes. (Author abstract reprinted by permission of the American Chemical Society)

75-1012. Plimmer, J. R.; Klingebiel, U. I. (Agric. Res. Cent., U. S. Dept. Agric., Beltsville, MD 20705). **Photochemistry of *N-sec*-butyl-4-*tert*-butyl-2,6-dinitroaniline.** *J. Agric. Food Chem. 22(4): 689-693; 1974.* (23 references)

The herbicide *N-sec*-butyl-4-*tert*-butyl-2,6-dinitroaniline photodecomposed in water or methanol. Irradiation in sunlight or light from a mercury arc gave the dealkylated nitroso compound (4-*tert*-butyl-2-nitro-6-nitrosoaniline) as the major product together with a mixture of minor photoproducts, including 4-*tert*-butyl-2,6-dinitroaniline. The structures of the minor products were investigated by mass spectrometry and provide evidence for the proposed mechanism of photochemical reaction. Two pathways may operate simultaneously. One involves excitation and subsequent reduction of the nitro group coupled with oxidation of other reactant molecules or solvent. The other minor pathway requires a displacement of the nitro group in either a radical or a photonucleophilic reaction. (Author abstract reprinted by permission of the American Chemical Society)

75-1013. Vardell, H. H. (Stored-Product Insects Res. Develop. Lab., Savannah, GA 31403). **Methyl bromide: effect of multiple fumigation on residues in flour.** *J. Econ. Entomol. 68(1): 69-70; 1975.* (3 references)

Pallet-size plywood containers holding forty-eight 50-lb bags of flour were fumigated with methyl bromide. These fumigations at 15.6, 21.1, and 26.7°C were repeated until the 125-ppm tolerance for inorganic bromide on the flour was reached or exceeded. The inorganic bromide residues increased with an increase in fumigation temperature even though the methyl bromide dosage was decreased. About 3, 4, and 5 methyl bromide fumigations of flour can be made at 26.7, 21.1, and 15.6°C, respectively, without exceeding residue tolerances. (Author abstract by permission)

75-1014. Parr, L. J.; Gee, M. G.; Land, D. G.; Robinson, D.; Curtis, R. F. (Agric. Res. Council Food Res. Inst., Norwich, England). **Chlorophenols from wood preservatives in broiler house litter.** *J. Sci. Food Agric. 25(7): 835-841; 1974.* (22 references)

The amounts of tetra- and pentachlorphenols entering 32 commercial broiler houses in the fresh wood shavings (used as bedding) and leaving in the spent litter were studied. The establishments studied were located throughout England. The fresh shavings contained 2,3,4,6-tetrachlorophenols at levels of 4-307 ppm (mean 53 ppm) and pentachlorophenols at levels of 1-83 ppm (mean 12 ppm). Most of this was lost during the period of growth of the chickens, residual levels of 0-5.6 ppm (mean 0.7) and 0-4.1 ppm (mean 0.3 ppm), respectively, being present in the spent litter. Only traces of the corresponding anisoles were found in a few samples. The spent litter is being used increasingly as a dietary constituent, especially for cattle; the residual phenols are unlikely to present a hazard in this regard. Encouraging the use of pentachlorophenol rather than 2,3,4,6-tetrachlorophenols for the prevention of sap-stain would be advantageous.

75-1015. Takagi, F.; Kaise, T.; Satio, Y.; Nukiyama, M.; Iida, K.; Watanabe, K.; Wada, H.; Fuchigami, S.; Nagano, H.; Yamawake, T.; Kuroi, N. (Kanagawa Prefect. Inst. Health, Kanagawa, Japan). **[Results of determination of pesticide residues in cow's milk, vegetables, and fruits.]** *Kanagawa-Ken Eisei Kenkyusho Nenpo (Annu. Rep. Kanagawa Prefect. Pub. Health Lab.) 23: 94-95; 1973.* (Japanese)

Pesticide residues were determined three times in cow's milk (α-, β-, and δ-BHC, total DDT, and dieldrin) and in vegetables and fruits (total-BHC, carbaryl, arsenic and lead). The average contents of the residues on market milk in the above order were 0.002, 0.003, ND, 0.002, and 0.001 ppm; these figures were well below the tolerance and nearly the same as in 1973. Residue determinations in 33 specimens of 17 species revealed contamination with BHC in 5 cases, lead in 2 cases, arsenic in 2 cases, and carbaryl in 4 cases; total BHC content was highest in leaves of Japanese radish, but it was one-third of the standard. The carbaryl content was very low. The following pesticide residues were not detected: DDT, parathion, dieldrin, endrin, EPN, malathion, fenthion, diazinon, dicofol, chlorobenzilate, fenitrothion, and tricyclohexyltin hydroxide.

75-1016. Elliott, M.; Farnham, A. W.; Janes, N. F.; Needham, P. H.; Pulman, D. A.; Stevenson, J. H. (Rothamsted Exp. Stn., Harpenden, Hertfordshire, England). **A photostable pyrethroid.** *Nature (London) 246(5429): 169-170; 1973.* (15 references)

A recent modification of the acid component of bioresmethrin gave a compound, 5-benzyl-3-furylmethyl (1R, *trans*)-2,2-dimethyl-3-(2,2-dichlorovinyl) cyclopropane carboxylate, which was more potent than most known insecticides. The insecticidal activity of esters of the modified acid were examined with other alcohols. The ester of 3-phenoxybenzyl alcohol was an active insecticide, the corresponding (±)-*cis, trans* esters showing comparable differences in activity. The 3-phenoxybenzyl ester showed significantly greater resistance to photodecomposition than the esters of 5-benzyl-3-furylmethyl alcohol. The photodecomposition products were not toxic to insects. The new esters have low toxicities for mammals.

75-1017. Usuya, S. (Hirosaki Univ., Hirosaki, Aomori, Japan). **[Human health aspects of pesticide residues on/in apples and citrus fruits.]** *Nippon Iji Shimpo (Jpn. Med. J.) 2647: 136-137; 1975.* (1 reference) (Japanese)

A question concerning the pesticide pollution in the case of utilizing the peelings of apple and citrus fruits as food was answered as follows: by thorough washing of the peelings with neutral detergent solution and then with water the minute amounts of pesticide residues will be largely removed. Although most of the applied pesticide adheres to the peel, it has been legally established that the appropriate pesticides can be safely applied. Actual pesticide residues on/in the peels are sometimes more than the standard; however, about 15 - 85% of this is removed by washing with the above mentioned method. The residues remaining on/in the peelings are further reduced during cooking into jam and marmalade as result of oxidation, degradation, and dissipation with water vapor. Finally, the daily intake of such food is low. Persons who are still anxious about the pesticide residues on/in the peelings would be better off using fruits grown without pesticides or not using the peelings.

75-1018. Krasil'shchikov, D. G. (Sci. Res. Inst. Epidemiol. Microbiol. Hyg., Min. Public Health Lithuanian SSR, Vilnius, USSR). **Ob opasnosti zagryazneniya pestitsidami iskusstvenno popolynyayemykh zaposov podzemnykh vod. [Hazards of contamination of artificially recharged groundwater reserves with pesticides.]** *Gig. Sanit. 39(8): 90-91; 1974.* (2 references) (Russian)

The penetration of sodium trichloroacetate, a water-soluble herbicide, and of BHC in river water through sandy soil with 0.5 and 0.12 mm sand particles was studied in a model experiment. At a sodium trichloroacetate concentration of 5 and 50 mg/kg, and at a rate of vertical filtration of 2 m/day in a 15-day experiment, the herbicide passed through the sand practically quantitatively as early as the first to second days. Detergent in the water had no effect on the retention. The retention showed a temporary increase due to the formation of a biological membrane, but leachout started again. Tests with 5 mg BHC per liter revealed increased passage of the pesticide in the presence of sulfonol NP-1. The findings indicate reduced retention of water-soluble pesticides especially in the presence of anionic detergents; the concentration of these should not exceed 0.5 mg/liter in water to be used for groundwater recharge. Waters should not contain pesticides in concentrations higher than their respective MAC values in water.

75-1019. Kanazawa, J. (Nat. Inst. Agric. Sci., Min. Agric. and Forestry, Tokyo, Japan). **[Residual mercury in soil of paddy fields.]** *Noyaku Kagaku (Pestic. Sci.) 2(3): 121-122; 1974.* (9 references) (Japanese)

A survey of the mercury content of surface soil (0-10 cm depth) of 12 actual paddy fields revealed that the content ranged from 0.13 to 0.44 ppm, the average in 10 fields in Niigata Prefecture being 0.3 ppm. Considering the natural occurrence of mercury at 0.02 - 0.1 ppm in paddy fields in Japan, it was considered that about 0.2 ppm of the mercury residue was due to organomercurial pesticides applied from 1953 to 1968. The content of methyl mercury in the surface soil ranged from 0.001 to 0.003 ppm, which could be due to impurities in the phenylmercury acetate used, not to methylation from inorganic mercury. Phenylmercury acetate in the surface soil was below the detection limit of 0.005 ppm, showing nearly complete conversion to the organic form within 8 years. The total mercury content of brown rice harvested in 1973 ranged from 0.05 to 0.07 ppm, compared to 0.02 ppm for that harvested from fields without application of mercurial pesticides. These results tend to confirm the belief that organomercurial pesticides applied to soil of flooded paddy fields are gradually converted to the inorganic form, resulting in HgS which is poorly taken up by plants.

75-1020. Hsu, J. M. C.; Camper, N. D. (Dep. Microbiol., Clemson Univ., Clemson, SC 29631). **Degradation of ioxynil to CO_2 in soil.** *Pestic. Biochem. Physiol. 5(1): 47-51; 1975.* (11 references)

The degradation of ioxynil (4-hydroxy-3,5-diiodobenzonitrile) to carbon dioxide was noted in a clay loam, high organic matter content soil. The majority of radioactivity was recovered as ^{14}C-carbon dioxide from both ring-labeled and cyano-labeled ioxynil. However, carbon dioxide was always released at a much faster initial rate from cyano-labeled ioxynil. No carbon dioxide was released in treated sterile soil, either aerobically or anaerobically. Mercuric chloride (10^{-5} *M*)

greatly inhibited the production of carbon dioxide from cyano-labeled and ring-labeled ioxynil, as did *p*-chloromercuribenzoate (5×10^{-5} *M*). Ferricyanide (10^{-4}*M*) caused slight inhibition. No ^{14}C-carbon dioxide was evolved from ring-labeled ioxynil under anaerobic conditions. Thus the degradation of ioxynil to carbon dioxide in soil is a consequence of microbial action and is oxygen dependent, which is consistent with the known mechanism of oxygenases in degrading benzene rings. Anaerobically, a small amount of ^{14}C-carbon dioxide was released from cyano-labeled ioxynil. Thin-layer chromatography of the culture supernatant revealed two intermediate metabolites, 3,5-diiodo-4-hydroxybenzamide and 3,5-diiode-4-hydroxybenzoic acid.

75-1021. Helling, C. S.; Dennison, D. G.; Kaufman, D. D. (Agric. Res. Cent. West, Beltsville, MD 20705). **Fungicide movement in soils.** *Phytopathology 64(8): 1091-1100; 1974.* (42 references)

Bioassay methods were developed and used in combination with soil thin-layer chromatography (soil TLC) to assess the mobility of fungicides in soils. After leaching soil TLC plates with water, 10 soil fungi (*Aspergillus fumigatus, Diplodia zeae,* two isolates of *Fusarium moniliforme, Fusarium roseum, Helminthosporium sativum, Penicillium chrysogenum, Penicillium rugulosum, Rhizoctonia solani,* and *Trichoderma viride*), and an alga (*Chlorella sorokiniana*) were tested as visualizing agents by spraying the plates with a liquified nutrient agar suspension of the organism. The plates were incubated at 100% RH and approximately 28°C until zones of inhibition or stimulation appeared, usually within 1-4 days. Cycloheximide, cycloheximide oxime, Ceresan (Granosan), Dexon (fenaminosulf), formetanate, formparanate, and oxycarboxin were relatively mobile in Hagerstown silty clay loam. Chloranil, chloroneb, DCNA, dichlone, dodine, hexachlorophene, Morestan (oxythioquinox), PCNB, TCNA, Terrazole, and zineb were immobile. Of the test organisms, *T. viride* and *C. sorokiniana* were the most sensitive to the greatest number of fungicides. The mobility order nabam, maneb, zineb was confirmed by bioassay and autoradiography. In five soils, the movement of these (^{14}C)dithiocarbamate fungicides was inversely related to the soil organic matter content.

75-1022. Trebicka-Kwiatkowska, B.; Radomanski, T.; Stec, J. (Inst. of Obstetrics and Gynecological Diseases, Acad. Med., Lublin, Poland). **Stezenia DDT i jego metabolitow w tkance lozyskowej i krwi zylnej kobiet z ciaza obumarla. [Concentration of DDT and its metabolites in placental tissue and venous blood of women with missed abortion.]** *Pol. Tyg. Lek. 30(42): 1769-1772; 1974.* (15 references) (Polish)

The levels of DDT and its metabolites were determined in placental tissues and venous blood of 9 women who were exposed to polychlorinated insecticides in month 2-5 of pregnancy and who delivered either dead (7) or dystrophic (2) fetuses. Deaths of fetuses occurred between weeks 29-39 of pregnancy, and delivery between weeks 33-43 (group I). Results were compared to those obtained in 10 women who delivered healthy infants and had no contact with insecticides (group II); residue levels of DDT and its metabolites were significantly higher in group I than group II. In group I the mean value (in ppm) of DDE in placental tissue was 0.0709, in blood 0.0446; in group II, 0.0202 and 0.0067 respectively. The mean values of DDT in group I were 0.0421 in placental and 0.0172 in blood, compared to 0.0142 and 0.0050 respectively in group II. Those of DDE + DDD + DDT were 0.1191 in placenta, 0.0634 in blood of group I and 0.0344 and 0.0117 respectively in group II. DDD (TDE) and HCH (BHC) were detected only in group I: DDD 0.0061 in placenta, 0.0017 in blood; HCH 0.0051 and 0.0027 respectively. The differences were statistically significant.

75-1023. Cerna, M. (Dairy Research Institute, Prague, Czechoslovakia). **Rezidua pesticidu v mlece a mlecnych vyrobcich. [Pesticide residues in milk and dairy products.]** *Prum. Potravin 25(8): 237-238; 1974.* (29 references) (Czech)

Chlorinated hydrocarbons, which are used as insecticides, are ingested by animals; they are retained in the fat and excreted in the milk. Their toxicity is due to a degenerative attack on the human central nervous system; carcinogenic, teratogenic, and mutagenic effects are suspected but so far unproven. Various methods were tried to reduce pesticide residues in cows. The most effective approach was accelerating excretion by administering activated charcoal or phenobarbital, but neither has been approved by the U.S. FDA. Reports from various countries indicate that pesticide residues in milk and dairy products are generally within the allowable concentration set by the FAO/WHO standards (Rome, 1967). However, a West German report shows that the highest concentrations of DDT and lindane in milk exceeded these standards by more than 100%, while the average was just below 50% of the allowable maximum. Pesticide residues in various domestic and imported cheeses in Italy exceeded the allowable limits, lindane by 26%, heptachlor epoxide by 11%, dieldrin by 32%, and DDT by 12%. Butter samples in Czechoslovakia and East Germany were well within the international standards.

75-1024. Van Bladel, R.; Moreale, A. (Univ. Louvain, 3030 Heverlee, Belgium). **Adsorption of fenuron and monuron (substituted ureas) by two montmorillonite clays.** *Soil Sci. Soc. Am. Proc. 38(2): 244-249; 1974.* (27 references)

The effect of the type of clay mineral, exchangeable cation, temperature, and electrolyte concentration on the adsorption of two substituted ureas was investi-

gated. The adsorption was greater on a Bentonite than on a Camp Berteau montmorillonite, possibly because the lattice charge in the former originates from tetrahedral and octahedral layers but in the latter only from octahedral layers. The adsorption increased with the polarizing power of the exchangeable cation. Normal adsorption isotherms were exothermic but when the temperature effect on solubility was accounted for, the adsorption reaction tended to be more and more temperature independent as the electronegativity of the exchangeable cation increased. Relative thermodynamic data suggest that the favorable contribution to the adsorption energy arises mainly from enthalpy changes. The effect of salt concentration was almost negligible up to 1.0*N* and for a given electrolyte good agreement was obtained between the heat of solution of the herbicide and its adsorption. (Author abstract by permission)

75-1025. Konstantinova, A. V.; Zhumamudinov, S.; Serov, V. M.; Burkser, G. V.; Gololobov, V. P. (Kirghiz Sci. Res. Inst. Zootechnic. Vet., USSR). **Ostatochnyye kolichestva DDT i GKhTsG v moloke korov khozyaystv Chuyskoy doliny. [Residual amounts of DDT and benzene hexachloride in the milk of cows in the Chuiska Valley.]** *Sov. Zdravookr. Kirg. 6: 51-52; 1973.* (Russian)

DDT and BHC residues were studied in 355 milk samples from the Chuiska Valley, USSR, by thin-layer chromatographic method. While DDT was detected in 78.5% of all milk samples in a range of 0.03-5.5 mg/l, 13% of all samples contained BHC in concentrations ranging from 0.05 to 2.4 mg/l. The DDT residue levels reached 5-10 mg/l in 0.3% of the samples. The DDT residue, present mostly in the form of non-metabolized DDT and DDE, was lowest in summer and highest in winter and spring. The BHC residue was mostly in the form of the γ- and β-isomers. The DDT concentration was lowest in the milk sample collected during the initial phase of the milking, the highest at the end of the milking, which corresponds to the dynamics of milk fat secretion.

75-1026. Gaeb, S.; Parlar, H.; Korte, F. (Inst. Oekol. Chem., Tech. Univ. Muenchen, Freising-Weihenstephan, Germany). **Beitrage zur oekologischen Chemie. - LXI. Photoreaktionen des Aldrin/Dieldrin-Metaboliten Dihydrochlordendicarbonsaure. [Contributions to ecological chemistry - 61. Photoreactions of the aldrin/dieldrin metabolite dihydrochlordene dicarboxylic acid (4,5,6,7,8,8-hexachloro-4,7-methano-3a,4,7,7a-tetrahydroindan-1,3-dicarboxylic acid).]** *Tetrahedron 30(9): 1145-1151; 1974.* (13 references)

The dicarboxylic acid (1) and its dimethyl ester (2) were irradiated in solution and in the gaseous phase by u.v. light above 230 nm. Immersion wells of pyrex and quartz were used for the irradiation experiments. Following u.v. irradiation and treatment of the reaction mixture with diazomethane, compounds 5-11 were isolated from solutions of 1 in acetone: similar results were obtained with 2. Other compounds (3 and 4) were obtained by irradiating 2 in *n*-hexane and water/methanol respectively at wavelengths below 300 nm. In the gas phase, distributed in air, 2 yielded two isomeric products and a dechlorination product on irradiation with u.v. light of wavelength less than 300 nm; one of the isomeric photoproducts was the bridged compound 5. The spectroscopic properties of compounds 1-11 are reported.

75-1027. Shevchenko, M. A.; Marchenko, P. V.; Taran, P. N.; Kravets, Ye. V. (Inst. Colloid Chem. Water Chem., Acad. Sci., USSR). **Ochistka pit'evoy vody ot nekotorykh pestitsidov adsorptsionnym metodom. [Adsorptive removal of certain pesticides from drinking water.]** *Vodosnabzh. Sanit. Tekh. 10: 31-32; 1974.* (6 references) (Russian)

The adsorptive removal of hexachlorane (BHC) and simazine from water was studied in a model experiment. At an initial pesticide concentration of 5 mg/l and a pH value of 6.5, aluminum sulfate at 60 mg/l, as commonly used for water clarification, reduced the hexachlorane concentration by 60%, but practically did not affect the simazine concentration. It was found possible to efficiently remove hexachlorane and simazine from drinking water by the use of powdered activated carbon. The activated carbon concentration necessary for the removal of pesticides ranges from 5 to 15 mg/l if the pesticide concentration is between 0.5 and 1.5 mg/m^3.

75-1028. McClure, G. W. (Boyce Thompson Inst. Plant Res., Yonkers, NY 10701). **A membrane biological filter device for reducing waterborne biodegradable pollutants.** *Water Res. 7(11):1683-1690; 1973.* (12 references)

A device having potential applications to water pollution control problems is modeled by a laboratory system in which a phenylcarbamate-degrading population of microorganisms reduces the concentration of the herbicide isopropylphenylcarbamate (IPC, propham) in a continuously flowing stream. The microorganisms are kept separate from the feed stream by an ultrafilter membrane which retains the organisms but allows passage of all smaller materials. As the feed stream passes through the device, ICP is transferred to the bath of microorganisms and metabolized. The percentage reduction of IPC in the feed stream depends primarily on the efficiency of transfer across the membrane, the velocity of the feed stream, the quantity of microbes retained in the bath, and the factors affecting their activity. An equation is derived relating these variables under the assumption of complete transfer of IPC to the bath and a constant rate of IPC degradation per unit of microbes.

75-1029. Crockett, A. B.; Wiersma, G. B.; Tai, H.; Mitchell, W. G.; Sand, P. F.; Carey, A. E. (Res. Develop.

Lab., Natl. Environ. Res. Cent., Las Vegas, NV). **Pesticide residue levels in soils and crops, FY-70 – National Soils Monitoring Program (II).** *Pestic. Monit. J. 8(2): 69-97; 1974.* (5 references)

This data report is a summary of Fiscal Year 1970 results of the National Soils Monitoring Program. It includes data on pesticide applications, soil residues, and crop residues collected from 1,506 cropland sites in 35 States. Pesticide application data are summarized by all sites and by State. Soil residue data are itemized similarly, but also include data by cropping region. Tables generally give the number of sites, number of times a pesticide was applied or detected, percent occurrence, arithmetic mean application rate or residue level, and range of residues detected. For some data, geometric means or 50 percentile levels, both with 95 percent confidence intervals, are presented. Pesticides applied most frequently were atrazine, 2,4-D, captan, and malathion. Farmers in cotton and corn cropping regions applied the most pesticides; those in grass hay and mixed hay areas applied the least. Dieldrin, DDTR, aldrin, chlordane, and heptachlor epoxide were the chlorinated hydrocarbon residues found in soil most frequently. Highest residue levels were found in the corn and cotton cropping regions; lowest levels were in the hay, general farming, and small-grain soils. (Author abstract by permission)

75-1030. Ware, G. W.; Estesen, B. J.; Cahill, W. P. (Dep. Entomol., Univ. Arizona, Tucson, AZ). **DDT moratorium in Arizona – agricultural residues after 4 years.** *Pestic. Monit. J. 8(2): 98-101; 1974.* (5 references)

The moratorium on agricultural use of DDT in Arizona that began in January 1969 has proved very effective during the 4 years of its enforcement. Residues on green alfalfa have declined significantly during this period to a probable inherent level of 0.03 ppm, wet weight. Soil residues of DDTR have changed almost imperceptibly: this suggests a soil half-life greater than 20 years. These soil residues are mostly DDE; the little remaining DDT is being converted gradually to DDE, the slowly degraded metabolite of DDT. This paper retracts a statement made in an earlier study which implied violation of the DDT moratorium in the Yuma mesa and valley in Yuma County. Authors have concluded that the consistently high residues in the Yuma area resulted from climatological conditions not found in other sampling areas, rather than from any violation of the moratorium. (Author abstract by permission)

75-1031. Knight, L. A., Jr.; Harvey, E. J., Sr. (Dep. Biol., Univ. Mississippi, University, MS 38677). **Mercury residues in the common pigeon (*Columba livia*) from the Jackson, Mississippi, area – 1972.** *Pestic. Monit. J. 8(2): 102-104; 1974.* (12 references)

Total mercury in the common pigeon (*Columba livia*) from the Jackson, Miss., area was measured by atomic absorption spectrophotometry. Pigeons captured in 1972 from downtown Jackson were killed on the day of capture to determine mercury levels in wild birds in urban environments; others were caged and analyzed for mercury residues weekly or biweekly for 9 weeks. Data are presented to show possible pathways by which organisms eliminate this element. Median concentration of mercury in brains of newly captured pigeons was 22 ppb. Claws showed 14 to 85 ppb mercury. Possible sources of mercury contamination in these birds are treated grains, contaminated weed seeds, and naturally occurring mercurials. (Author abstract by permission)

75-1032. Zitko, V.; Choi, P. M. K.; Wildish, J.; Monaghan, C. F.; Lister, N. A. (Environ. Canada, Biol. Stn., St. Andrews, New Brunswick, Canada). **Distribution of PCB and *p,p'*-DDE residues in Atlantic herring (*Clupea harengus harengus*) and yellow perch (*Perca flavescens*) in Eastern Canada – 1972.** *Pestic. Monit. J. 8(2): 105-109; 1974.* (9 references)

In two localities of Eastern Canada in 1972, Atlantic herring (*Clupea harengus harengus*) and yellow perch (*Perca flavescens*) were analyzed for residues of polychlorinated biphenyls (PCB's), *p,p'*-DDE, *p,p'*-DDD (TDE), and *p,p'*-DDT, and for lipid and body weight. From each locality, 24 herring and 25 perch were analyzed: all were males between 2 and 4 years old, and all were analyzed individually. Data were statistically evaluated. In most cases PCB, *p,p'*-DDE, and lipid were better approximated by lognormal distribution; weight was better approximated by normal distribution. All determined parameters were highly variable. One objective of the study was to weigh the possibility of using the two species under observation to detect temporal trends in levels of environmental contamination by PCB's and *p,p'*-DDE. The study concludes, however, that it is probably impossible to detect a significant change of PCB levels in fish of equal age in 2 consecutive years by using samples of this size. (Author abstract by permission)

75-1033. Manske, D. D.; Corneliussen, P. E. (Field Office Lab., Food Drug Adm., Kansas City, MO 64106). **Pesticide residues in total diet samples (VII).** *Pestic. Monit. J. 8(2): 110-124; 1974.* (13 references)

Pesticide residue levels detected in ready-to-eat foods remained at relatively low levels during the seventh year of the Total Diet Study in its present form. Samples were collected from 30 markets in 27 different cities. Populations of cities ranged from less than 50,000 to 1,000,000 or more. Averages and ranges of pesticides commonly found are reported for the period June 1970-April 1974 by region and food class. Pesticides found infrequently are also reported for this period by region and food class. Results of recovery studies with various classes of pesticides are also presented. After October 1970, analyses of bromides, amitrole, and dithiocarbamates were discontinued; mercury and ortho-

phenylphenol were added. Residue levels in three major fatty food groups are now reported on a whole-product basis, rather than on a fat basis. Data for June and August were adjusted accordingly. (Author abstract by permission)

75-1034. Collins, H. L.; Markin, G. P.; Davis, J.* (Methods Develop. Lab., Anim. Plant Health Inspect. Serv., Gulfport, MS 39501). **Residue accumulation in selected vertebrates following a single aerial application of mirex bait, Louisiana – 1971-72.** *Pestic. Monit. J. 8(2): 125-130; 1974.* (17 references)

A survey to monitor accumulation of mirex residues in 61 species of vertebrates and certain components of the human food chain was conducted in Louisiana from May 1971 to May 1972 following a single application of mirex bait. All gas-liquid chromatographic analyses were performed on composited, whole-body homogenates. Levels of residues detected ranged from less than 0.001 to 8.483 ppm. Highest concentrations of mirex were detected in loggerhead shrikes and mockingbirds 3 months after treatment. Although mirex was detected in 89 percent of the total samples analyzed, residues noted were usually less than 1 ppm. (Author abstract by permission)

75-1035. Markin, G. P.; Collins, H. L.; Davis, J.* (Methods Development Lab., Anim. Plant Health Inspect. Serv., Gulfport, MS 39501). **Residues of the insecticide mirex in terrestrial and aquatic invertebrates following a single aerial application of mirex bait, Louisiana – 1971-72.** *Pestic. Monit. J. 8(2): 131-134; 1974.* (4 references)

Samples of 25 invertebrates were collected for 1 year following a broadcast application of mirex bait to 1,000 hectares of land in southeastern Louisiana for control of the imported fire ant. Immediately following the treatment, residues of 5.504 to 22.153 ppm were found in scavengers such as the imported fire ant which fed directly upon the bait. Predatory invertebrates accumulated residues more slowly; a maximum level of 10.010 ppm was found in spiders 10 weeks after the treatment. Herbivorous invertebrates usually did not accumulate significant amounts of mirex. Residue levels in all terrestrial and aquatic invertebrates decreased greatly during the following year; no detectable residues were found in 68 percent of the samples at the end of the study. (Author abstract by permission)

75-1036. Spence, J. H.; Markin, G. P. (Anim. Plant Health Inspect. Serv., Gulfport, MS 39510). **Mirex residues in the physical environment following a single bait application, 1971-1972.** *Pestic. Monit. J. 8(2): 135-141; 1974.* (5 references)

In 1971 and and 1972, samples of soil, sediment, water, and Bahia grass were collected at various intervals in Louisiana and Mississippi after the areas had been aerially treated with mirex to control the red imported fire ant (*Solenopis invicta* Buren). In Louisiana, samples were collected throughout the first year after spraying; in Mississippi, they were taken for the first 4 months. Samples had also been collected from the physical environment in both States before spraying began. Residues in the sediment at the bottom of ponds increased gradually after treatment, indicating that mirex was being carried in by runoff water. Residues reached maximum levels (0.7 and 1.1 ppb) about 1 month after treatment, and gradually declined thereafter. Soil residues in the Louisiana study built up to a peak of 2.5 ppb after 1 month and gradually declined over the remainder of the year. Bahia grass in Louisiana had residues in both roots and blades, indicating that some translocation occurred from the roots upward. In Mississippi, residue patterns of pond sediment were less predictable than in sediment of Louisiana ponds, but levels peaked at about the same interval: 1 month after treatment. Water in the pond showed the highest residue levels immediately after treatment, 0.020 and 0.530 ppb, and still had detectable levels of 0.001 to 0.005 ppb as long as 3 months after treatment. Bahia grass roots and blades were combined for analysis; the highest residue levels (26 ppb) occurred between 3 and 4 months after treatment. (Author abstract by permission)

75-1037. Mick, D. L.; Hetzler, H.; Slach, E. (Iowa Dep. Environ. Qual., Des Moines, IA 50316). **Organochlorine insecticide residues in carpeting.** *Pestic. Monit. J. 8(2): 140-141; 1974.* (1 reference)

Organochlorine insecticide (OCI) residues were detected by gas-liquid chromatography in carpet samples in 1973. Dieldrin was found in largest quantities; it was also found most frequently, existing in 84 percent of the samples. Wool carpet had higher residue levels than did synthetic carpet. OCI residues were also found in raw wool, but at much lower levels, indicating that most of the residues had been absorbed at the carpet mill rather than on the farm. Carpeting may represent a potential source of human exposure to organochlorine insecticides. (Author abstract by permission, supplemented)

75-1038. Schneeweis, J. C.; Greichus, Y. A.; Linder, R. L. (Minnesota Dep. Nat. Resour., International Falls, MN 56649). **Organochlorine pesticide residue levels in North American timber wolves – 1969-71.** *Pestic. Monit. J. 8(2): 142-143; 1974.* (2 references)

Tongue and muscle tissue samples from 51 timber wolves captured in Minnesota and northwest Ontario in 1969-71 were analyzed for organochlorine pesticide residues in an attempt to determine the level of insecticide contamination in their environment. No determined residue levels exceeded the minimum analytical confidence limits established in a previous study by one of the authors. The implementation of new State,

national, and international legislation protecting timber wolves makes this study especially valuable because samples from a wide range of age groups will no longer be readily available for analysis. (Author abstract by permission)

75-1039. Ragab, M. T. H. (Res. Stn., Agric. Canada, Kentville, Nova Scotia). **Residues of picloram in soil and their effects on crops.** *Can. J. Plant Sci. 55(1): 55-59; 1975.* (23 references)

When 4.48 kg/ha (2 ppm) of picloram (4-amino-3,5,6-trichloropicolinic acid) as the potassium salt (Tordon 22K) was incorporated with soil to a depth of 15 cm; 1.86, 1.78, 1.32, 0.70, 0.28, 0.12 and 0.02 ppm were detected at 18, 63, 145, 337, 504, 690 and 843 days after application, respectively. Growth of carrots (*Daucus carota* L. cv. Nates), parsnips (*Pastinaca sativa* L. cv. Hollow crown), potatoes (*Solanum tuberosum* L.), table beets (*Beta vulgaris* L. cv. Detroit dark red), and rutabagas *Brassica napobrassica*, Mill, cv. Laurentian) was inhibited when these crops were planted in the greenhouse in soil containing 1.32 ppm picloram which was collected 145 days after application. The year after application when soil sampled about 1 mo before planting contained 0.70 ppm picloram, the growth of sweet corn (*Zea mays* L.) and oats (*Avena sativa* L.) was reduced by about 20%, whereas beans (*Phaseolus vulgaris* L.), parsnips and Swiss chard (*Beta vulgaris* var. *cicla* L.) did not grow. Picloram residue 1,055 days after application was 2.5 ppb determined by a bioassay using bean as the indicator plant. (Author abstract by permission)

75-1040. Braun, H. E.; McEwen, F. L; Frank, R. (Provincial Pestic. Residue Testing Lab., Ontario Minist. Agric. and Food, Univ. Guelph, Guelph, Ontario). **Residues of chlorpyriphos and leptophos in three field-treated vegetable crops.** *Can. J. Plant Sci. 55(1): 133-137; 1975.* (5 references)

Residues of chlorpyriphos (chlorpyrifos) and leptophos were determined in lettuce (*Latuca sativa* var. *capita* L.), onions (*Allium cepa* var. *viviparum* Metz), and carrots (*Daucus carota* var. *sativa* DC.) treated with two and three applications of the insecticides at rates of 0.6 to 2.4 kg/ha. The first application was made before seeding and the second and third applicatons were made to the emerged and established seedling, respectively. Mean residues of chlorpyrifos at crop maturity ranged from 0.002 to 0.019 ppm in lettuce, 0.002 to 0.010 ppm in onions, and 0.006 to 0.032 ppm in carrots; residues of leptophos in the marketable vegetable ranged from 0.001 to 0.015 ppm in lettuce, 0.002 to 0.013 ppm in onions, and 0.001 to 0.012 ppm in carrots. The respective oxygen analogs could not be detected in any samples. The phenolic hydrolysis product of chlorpyrifos (3,5,6-trichloro-2-pyridinol) was analyzed in carrots and was not detectable to a limit of 0.005 ppm. (Author abstract by permission)

See also **75-1000** **75-1022** **75-1067** **75-1113** **75-1143**

75-1041. Pimentel, J. C.; Menezes, A. P. (Fac. Med., Univ. Lisbon, Lisbon, Portugal). **Liver granulomas containing copper in vineyard sprayer's lung. A new etiology of hepatic granulomatosis.** *Am. Rev. Resp. Dis. 3(2): 189-195; 1975.*

Three cases of vineyard sprayer's lung are described in which the patients' symptoms seem to have been triggered or aggravated by intercurrent infections. The men (aged 52-57 yr) were exposed to copper sulfate solution neutralized with hydrated lime (Bordeaux Mixture) for periods of 3 to 15 yr. The diagnosis, confirmed at autopsy in 2 and by lung biopsy in 1 case, were based on occupational history and on the finding of granulomas and fibro-hyaline nodular scars containing inclusions of copper. In each case, hepatic changes consisted of proliferation and diffuse swelling of Kupffer's cells, sometimes showing a tendency to cluster, and the formation of well-defined histocytic or sarcoid-type granulomas. The lesions in the liver were not accompanied by significant clinical or biochemical abnormalities except in one alcoholic sprayer in whom cirrhosis was identified. These cases suggest that in patients in whom pulmonary and hepatic granulomas of unknown cause co-exist or in whom the diagnosis of sarcoidosis is made by exclusion, the possibility of the existence of a disease caused by the inhalation of pathogenic dusts must be considered.

75-1042. Chugh, K. S.; Singhal, P. C.; Sharma, B. K. (Postgrad. Inst. Med. Ed. Res., Chandigarh, India). **Methemoglobinemia in acute copper sulfate poisoning.** *Ann. Intern. Med. 82(2): 226-227; 1975.* (4 references)

A 27 yr old male was hospitalized 2 hr after ingesting more than 50 grams of copper sulfate. Vomiting of greenish gastric contents occurred 3 times before admission. Gastric lavage confirmed copper sulfate. Fluid therapy was started i.v. and peritoneal dialysis commenced. Deep cyanosis developed 5 hr after ingestion followed by severe oliguria. Venous blood was chocolate brown in color. Hemoglobin was 15 g/100 ml, 36% of which was methemoglobin. Severe intravascular hemolysis was indicated. Circulatory collapse occurred in the 10th hr, as did hypotension, shock, and coma. The patient was given ascorbic acid (1 g) and methylene blue (200 mg) i.v. in 3 divided doses. Respiration was assisted but did not improve the cyanosis. Death occurred 16 hr after ingestion. Blood urea had risen to 70 mg/100 ml, serum creatinine to 3 mg/100 ml. Peak blood copper level was 8267 μg/100 ml (normal is 214 ± 52 μg/100 ml). Methemoglobinemia was confirmed. Erythrocytes showed glucose 6-phosphate dehydrogenase deficiency. Whether this deficiency existed prior to ingestion or not is uncertain. It may have been secondarily induced by unusually high levels of copper in the blood: evidently an excessive oxidant stress produced by copper in the setting of glucose 6-phosphate dehydrogenase deficiency contributed to the development of significant methemoglobinemia.

75-1043. Westhoff, D. D.; Samaha, R. J.; Barnes, A., Jr. (Internal Medicine Consultants, Inc., Jefferson, City, MO 65101). **Arsenic intoxication as a cause of megaloblastic anemia.** *Blood 45(2): 241-246; 1975.* (15 references)

A 47 yr old male was hospitalized due to incapacitating burning paresthesias and weakness of the lower extremities. About 3 weeks earlier, the patient noted numbness of his hands and feet which had gradually progressed. He had intermittent nausea and vomiting for 1 week. He was exposed to a weed spray approximately 2 weeks prior to admission. Three to 5 days following exposure, he developed periorbital edema and transient desquamation of the skin over his arms, chest, and abdomen. He had taken diazepam (Valium) and propoxyphene napsylate (Darvon-N). Arsenic content of the urine (2.2 mg/liter), nails (46 μg/g) and hair (39 μg/g) was markedly elevated. The SGOT level was raised and minimal hepatitis was demonstrated by liver biopsy. Laboratory findings showed ineffective erythropoiesis due to a megaloblastic process, including macroovalocytes, mild pancytopenia, low reticulocyte index, increased marrow cellularity with erythroid hyperplasia, and morphologic evidence of megaloblastic maturation in the marrow. The patient's serum folate and vitamin B12 were normal, and the anemia regressed without therapy. It is suggested that combination of megaloblastosis with normoblastic or megaloblastic karyorrhexis should raise the suspicion of arsenic intoxication in the mind of the observer. Arsenic should also be added to the list of agents causing a reversible megaloblastic anemia.

75-1044. Lewin, J. F.; Love, J. L. (Chem. Div., Dep. Sci. Ind. Res., Private Bag, Petone, New Zealand). **A death caused by the ingestion of mevinphos.** *Forensic Sci. 4(3): 253-255; 1974.* (5 references)

A well-nourished 31-year-old male, under treatment for severe depression, consumed mevinphos after drinking alcohol. Death occurred within 45 minutes. Postmortem findings included marked cyanosis of the upper chest, shoulders, and face; excessive thick mucus in the larynx, trachea, and bronchi; deeply congested and edematous lungs with patchy intra-alveolar hemmorhage; and patchy necrosis and discoloration of the stomach mucosa. Gas chromatographic analysis showed the following mevinphos concentrations: blood, 360 mg/kg; urine, 8 mg/kg; stomach contents, 12 mg/190 ml; stomach wall, 3.4 g/kg; liver, 240 mg/kg; kidney, 20 mg/kg; brain, 3 mg/kg; and skeletal muscle, 86 mg/kg. The blood cholinesterase activity was almost completely inhibited. Alcohol was also detected in the blood (125 mg/100 ml) and urine (155 mg/100 ml).

75-1045. Ramachandran, S.; Rajapakse, C. N. A.; Perera, M. V. F. (Colombo North Gen. Hosp., Ragama, Sri Lanka). **Further observations on paraquat poisoning in man.** *Forensic Sci. 4(3): 257-266; 1974.* (13 references)

The clinical features, course of illness, biochemical consequences, and autopsy findings in four fatal cases of paraquat poisoning are described. The temporal sequence of the clinical features showed individual variations. The appearance of the tongue is of early diagnostic significance; a scorched, yellowish-red appearance due to ulceration and superficial necrosis (occurring about the third day) is characteristic of paraquat poisoning. A latent period of 2-4 days before the appearance of clinical manifestations after poisoning was a constant feature. In patients surviving the first week of illness, a short period of apparent clinical recovery may occur, with a decline in serum bilirubin and blood urea values, only to be followed by rapid deterioration and death. There was a striking dissociation between the clinical features and the pathological findings, and the radiological changes in the lungs did not reflect the nature and severity of the pulmonary lesions. The spectrum of pathological changes in the liver, kidneys, and lungs was diverse, and the temporal sequence of the lung lesions appeared to reflect closely the progression of the pulmonary changes in experimental paraquat poisoning. The pulmonary reaction was undoubtedly the cause of death in the patients surviving the second week of the illness.

75-1046. Van Bao, T.; Szabo, I.*; Ruzieska, P.; Czeizel, A. (Dep. Toxicol. Internal Med., S. and F. Koranyi Hosp., Budapest, Hungary). **Chromosome aberrations in patients suffering acute organic phosphate insecticide intoxication.** *Humangenetik 24(1): 33-57; 1974.* (34 references)

The mutagenicity of malathion, trichlorfon, methylparathion, mevinphos, dimethoate, diazinon, and dichlorvos type phosphoric acid esters was studied in the lymphocyte cultures of patients suffering intoxication as a result of suicide attempts (22 cases) or occupational exposure (9) following violation of safety measures or inexperience. A temporary but significant increase in the frequency of chromatid breaks and stable chromsome-type aberrations was found in patients with acute intoxication, indicating chromosome mutation. In patients who died, a 10- and 3-fold increase in the frequency of breaks and stable chromosome aberrations, respectively, was found. In patients with serious intoxication the frequency of numerical and unstable chromosome aberrations was essentially unchanged while those of chromatid breaks and stable chromosome aberrations increased significantly immediately after intoxication. One month later an increase in the frequency of acentric fragments was demonstrated and the occurrence of stable aberrations remained on a high level. After 6 months no significant changes were found when compared to controls. Patients less seriously intoxicated suffered milder chromosome alterations. The number of chromatid breaks increased only in malathion and trichlorfon intoxication. Isobreaks and exchange figures only occurred in persons intoxicated with malathion and trichlorfon. The number of unstable chromosome aberrations was only higher in the case of malathion immediately after intoxication. The frequency of stable chromosome aberrations showed a significant increase with malathion, trichlorfon, mevinphos, and methylparathion, though malathion induced an outstandingly high number of structural chromosome aberrations.

75-1047. Talley, D. S. (Univ. Oklahoma, Norman, OK). **Occupational health hazards experienced by pest control operators.** *Diss. Abstrs. Int. 34(4): 1600B; 1973.*

Information collected from the 68 member firms of the Oklahoma Pest Control Association in April-August, 1972, was analyzed to determine the amounts and kinds of pesticide exposure experienced by the operators, their experience in handling toxic chemicals, and their training and supervision. The average Oklahoma pest control operator was exposed on 18.9 days per month. Chlordane was the most extensively used pesticide, and was usually applied in concentrations of 1% or less. Diazinon, the most widely used organophosphate, was usually applied in concentrations of 0.5% or less. Carbaryl was the most widely used carbamate and was often used in combination with organophosphates or chlorinated hydrocarbons. Tree and/or shrub spraying presented a greater potential for environmental contamination than any other pesticide application procedure studied. The average educational level of pest control owners/operators was high, but employee attendance at pest control training courses was poor. Practically all owners required their employees to use at least one protective device, indicating that they were aware of the potential hazards; but enforcement of these requirements was ineffective. Many pest control firms were combined with other businesses, thus reducing exposure levels for employees. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-23,996).

75-1048. Ishikawa, S. (Kitasato Univ., Kanagawa, Japan). **[Neurological ophthalmology and toxicology.]** *Ganka Rinsho Iho (Jap. Rev. Clin. Ophthalmol.) 69(1): 115-117; 1975.* (6 references) (Japanese)

The recent increase of chemically induced neuro-ocular diseases and the difficulty of diagnosing chronic cases are described. In such cases, neuro-ophthalmological experience is necessary because the sensory and movement systems, pupils, and ciliary muscles of the ocular system are extremely sensitive to toxic materials. Clinically it is important to classify the subjective symptoms as sympathetic or parasympathetic tension-type, then to conduct electrophsyiological examinations such as ERG, EOG, and determination of sensitivity to red and green, then to examine the movement of the eyeball. The problem of chronic intoxication due to organophosphorus pesticides is discussed in particular. The author points out that there are

two oppositely directed response systems varying with the strength of irritation by such organophosphorus pesticides. In order to classify cases of myopia as congenital or toxic, it is advisable to see whether there is strong corneal astigmatism, visual field stenosis due to mental factors, large scotopic ERG, higher amino acid content of blood, abnormal values of LDH, CPK, CCLE etc., and abnormal papilla of optic nerve. It is also advisable to administer atropine, tathion or padrin while monotoring intraocular pressure.

75-1049. Pilinskaya, M. A. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, and Plastic Materials, Ministry of Public Health of the USSR, Kiev, USSR). **Rezul'taty tsitogeneticheskogo obsledovaniya lits, professional'no kontaktiruyushchikh s fungitsimdom tsinebom. [Results of cytogenetic examination of persons occupationally exposed to the fungicide zineb.]** *Genetika 10(5): 140-146; 1974.* (25 references) (Russian)

The cytogenetic activity of zineb was studied in peripheral blood lymphocyte cultures from 15 workers occupationally exposed to zineb during its production for 1 to 10 months. The frequency of aberrant metaphases amounted to 5.98% as compared with 1% in the control. The average frequency of the chromosomal aberrations per cell was 0.0065 as compared with 0.010 in the control group. The ratio of chromatid type to chromosome type aberrations was 2.8:1. The identified, zineb-induced ruptures in the chromosomes were randomly distributed. While 77.66% of the ruptures were localized in the long arms of the chromosomes, the greatest number of lesions was localized in the lower third of the length of the arm (72.1% in the long arms, and 76% in the short arms). The findings indicate a significantly increased frequency of chromosomal aberrations in the lymphocytes, thus implying a potential genetic danger of zineb for human somatic cells.

75-1050. Kaloyanova, F.; Zielhuis, R. L. (Cent. Hyg., Acad. Med., Sofia, Bulgaria). **Occupational health criteria for the evaluation of pesticides. Conclusions and recommendations of a workshop, Sofia, Bulgaria, April 9-11, 1974.** *Int. Arch. Arbeitsmed. 33(4): 335-341; 1974.*

A workshop was convened to consider criteria for the evaluation of pesticides as related to occupational health. This report presents the conclusions and recommendations of that workshop. Occupational health hazards depend not only on the dose-effect relation of the pesticides as such, but also on the chemical properties of the compounds, the physical traits of the employees, the environmental conditions, the mode of application, and measures of protection and supervision afforded. It was suggested that toxicity testing be conducted more with actual operating conditions in mind. Minimum re-entry times for safe working conditions should be developed to indicate when it is safe to resume operations. Choice of parameters in the routine supervision of workers was discussed. A series of graded authorizations for use of a chemical proceeding from small-scale field trials to final clearance on a commercial or wide-scale range was proposed. It was recognized that standard hazard classifications are seldom adequate for the prediction of hazards under use conditions. A broad discussion was held on the evaluation of teratogenic, mutagenic, and carcinogenic activity of various pesticides. Deficiencies in tests currently employed along these lines were examined. A working group was formed to study these particular topics.

75-1051. D'yachuk, I. A. (Regional Sanit. Epidemiol. Stn., Kishinev Med. Inst., Komrat, USSR). **Gigiyenicheskiye rekommendatsii k proyektirovaniyu i soderzhaniyu kontrol'nosemennykh laboratory. [Hygienic recommendations concerning the design and equipment of seed-control laboratories.]** *Gig. Sanit. 39(9): 94-96; 1974.* (4 references) (Russian)

Hygienic recommendations concerning the designing and equipping of seed-control laboratories handling fungicide-dressed seeds are presented. When handling TMTD (thiram)-treated seeds, the TMTD concentration in the laboratory air usually ranged from 0.2 to 12.5 mg/m^3. Granosan-treated seeds release ethylmercury chloride in a concentration of 0.0015-1.1 mg/m^3. To prevent the penetration of ethylmercury chloride and other volatile compounds into the surfaces in laboratory, and consequently their secondary desorption from these surfaces, the latter must be sealed by special surface treatment techniques.

75-1052. Dmitriyeva, O. V. (I.P. Pavlov Ryazan Med. Inst., Ryazan, USSR). **Gigiyenicheskaya otsenka posledovatel'nogo deystviya kompleksa pestitsidov, primenyayemykh v sel'skom khozaystve. [Hygienic assessment of the consecutive exposure to different pesticides used in agriculture.]** *Gig. Sanit. 39(9): 107-109; 1974.* (7 references) (Russian)

The toxic effect of different, consecutively acting agricultural pesticides was studied in subjects occupationally exposed to such preparations and in animal tests. The reduction of the blood serum SH group level and the inhibition of lactate dehydrogenase activity were most pronounced in subjects exposed to pesticides for over 6 years. The serum SH group level and the cholinesterase activity were lower in subjects having contacted pestcides and fungicides (granosan) consecutively than in subjects exposed to granosan only. Potentiation of the toxic effect of granosan by copper-containing pesticides and organophosphorus pesticides was determined. Granosan was found to potentiate the effect of anthio (formothion) on the cholinesterase activity in rats fed 1/20 LD50 of granosan and anthio for 15 days each consecutively. The measurement of the brain cholin-

esterase activity was the most sensitive test for studying the consecutive effects of granosan and anthio. A 15-day interval between the subsequent poisonings with granosan and anthio for 15 days each was insufficient for normalization of the biochemical parameters, while a 30-day interval normalized the leukocyte count, the phosphomonoesterase-1 activity, and the blood SH group level.

75-1053. Vrochinskiy, K. K. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, and Plastic Materials, Kiev, USSR). **Ustanovleniye raschetnykh PDK i DOK pestitsidov v ob"ektakh vneshney sredy na osnovanii printsipa kompleksnogo normirovaniya. [Setting up of estimated maximum permissible and allowable concentrations of pesticides in environmental objects, based on the principles of complex standardization.]** *Gig. Tr. Prof. Zabol. 12: 31-34; 1974.* (2 references) (Russian)

Complex standardization of maximum allowable concentrations of pesticides in food, water, and air is described with regard to organochlorine and organophosphorus pesticides. After determining the permissible harmless dose for humans, the maximum allowable concentrations in air, water, and food are calculated in proportion to the respective percentages of the pesticides in air, water and food as consumed by humans (e.g., 93% in food, 9% in water and 1% in air for organochlorine pesticides, and 80% in food, 10% in water, and 6% in air for organophosphorus pesticides), with respect to the daily consumption of food, water, and air. The maximum allowable pesticide concentration in food is corrected with respect to the distribution of pesticide residues among different types of food products. Good agreement of these estimated and experimentally determined maximum allowable concentrations of pesticides in food products was found in 50% of all cases.

75-1054. Genina, S. A. (Sanit. Epidemiol. Stn., Ukrainian Civil Aviation Administration, Kiev, USSR). **Dinamika aktivnosti kholinesterazy krovi letnotekhnicheskogo sostava vo vremya raboty s nekotorymi fosfororganicheskimi insektitsidami. [Dynamics of blood cholinesterase activity in workers exposed to some organophosphorus insecticides during aerochemical application.]** *Gig. Tr. Prof. Zabol. 12: 42-44; 1974.* (4 references) (Russian)

The dynamics of cholinesterase activity were studied in workers exposed to metaphos (methyl parathion), trichlorfon, and rogor (dimethoate) during aerial spraying procedures. The whole blood, plasma, and erythrocyte cholinesterase activities were determined by Hestrin's method, and rapid methods by A. A. Pokrovskiy and Herzfeld-Strumpf were used for plasma cholinesterase investigation. The investigations were performed before and up to 25 days after exposure. The pesticide concentrations were between 0.01 and 40 mg/m^3 in the cockpit and in the warehouse. The blood cholinesterase activity showed an initial increase during the first 2 to 5 days of exposure, followed by a sharp decrease and stabilization between the 7th and 10th days, then by normalization despite continued exposure. The cholinesterase activity measured at the end of the observation period sometimes reached values of up to 200% of the initial level. The inhibition of the cholinesterase activity in the serum both started earlier and was more pronounced than that in the whole blood and erythrocytes in which the evolution of the cholinesterase activity followed a similar course. Complete normalization of the cholinesterase activity occurred at an earlier date in the whole blood and erythrocytes than it did in the plasma. The absence of manifest symtoms of acute poisoning against the background of sharply reduced cholinesterase activity is indicative of adaptive and defense mechanisms.

75-1055. Pernov, K.; Kyurkchiyev, S. (Inst. Hyg., Accident Prevention and Occup. Dis., Sofia, Bulgaria). **Ob ostrykh professional'nykh otravleniyakh lindanom. [Acute occupational poisoning by lindane.]** *Gig. Tr. Prof. Zabol. 12: 46-47; 1974.* (Russian)

Acute poisoning with lindane in a 42-year-old male worker employed in lindane production is reported. Depression, headache, emesis, asthenia, epileptiform attacks, sleeplessness, profuse perspiration, pathologically increased tendon reflex, oral automatism, bilateral Marinescu-Radovici reflex, tremor of the fingers, Romberg's signs, and Hoffmann's and Troemmer's signs in the upper extremities were determined. The blood lindane level was between 0.5 and 0.1 ppm. The cerebrospinal fluid contained 0.2 ppm lindane several weeks after poisoning. Diffuse disturbance, paroxysmal activity during photostimulation, and epileptogenic activity were found in EEG tests. The condition was diagnosed as acute toxic encephalopathy. The patient responded well to therapy with barbiturates, sedatives, glucose, and vitamins C and B12.

75-1056. Heyndrickx, A.; Van Hoof, F.; De Wolf, L.; Van Peteghem, C. (Dep. Toxicol., State Univ. of Ghent, Ghent, Belgium). **Fatal diazinon poisoning in man.** *J. Forensic Sci. Soc. 14(2): 131-133; 1974.* (9 references)

A 65-year-old woman ingested the organophosphorus insecticide, diazinon, and cut both radial veins in a suicide attempt. Autopsy revealed diazinon in the stomach and small intestine. The concentration in various tissues was determined by flame ionization or the more sensitive thermionic phosphorus detector. These tests showed stomach content 756 mg%, small intestine content 262 mg%, brain 30 μg%, liver 8 μg%, kidney 4 μg%, and lung 1.5 μg%. These detection techniques did not reveal the presence of any diazinon metabolites.

75-1057. Nagata, H.; Izumiyama, T.; Kamata, K.; Takano, S.; Suzuki, H.; Kobayashi, S. (Hokushin Gen. Hosp., Nagano, Japan). **[Studies on the system of health control of pesticide-handling farmers, especially of operators of speed sprayers: from the data of a recent 3-yr survey in the fruit tree growing district.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.) 23(4): 507-517; 1974.* (56 references) (Japanese)

Medical examinations and health status surveys of the operators of pesticide speed sprayers in 3 areas of Nagano Prefecture's apple growing region have been carried out from 1970 to 1972. The operators themselves are farmers, and they treat their own fields with pesticides. Examinations were carried out once in July 1970 and three times from May to October in 1971 and 1972. The percentage of intoxicated persons was highest in June every year; however, the percentage generally decreased compared to that when parathion was used. The number of persons whose hemoglobin was below normal decreased from 1971 to 1972. The serum ChE activity showed the smallest decrease in 1972. GOT showed a tendency to increase toward the end of the pesticide applying season; the serum alkaline phosphatase activity also showed a tendency to increase toward the end of the season. A constant number of persons with abnormally high urine urobilinogen was found, and in general no case of acute or chronic intoxication could be recognized. A discussion was conducted concerning cooperative pesticide application, the improvement of protective devices and machinery, and methods of pesticide application.

75-1058. Tsutsui, J.; Kato, T.; Nishikawa, T. (Study Group on Pesticide Pollution, Chusei Gen. Hosp., Mie, Japan). **[Results of health survey on persons engaging in pesticide application in Suzuka area, Mie Prefecture.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.) 23(4): 518-521; 1974.* (Japanese)

A survey was taken on the health status of 17 persons engaging in pesticide application in 5 sub-areas in Suzuka area, Mie Prefecture, during 1970, 1971, and 1972. The items in the survey consisted of history taking, general physical examination, urinalysis, determination of *p*-nitrophenol in urine, RBC, hemoglobin, hematocrit, blood density, transaminase, cholinesterase, alkaline phosphatase, ECG, examination of lung function, and examination for farmer's disease syndrome and fatigue. Generally speaking, it was difficult to point out any change in health status over the time course. Although anemia was found every year, it could not be attributed to pesticide intoxication when the poor nutritional conditions in rural areas were taken into consideration. Although there were persons with low ChE activity and disturbed liver function, because there was no significant difference from those of controls, this could not be attributed to the direct effects of pesticide. Although it is clear that persons engaging in pesticide application were affected by pesticides, it was strongly felt that the clinical recognition of these facts was extremely difficult.

75-1059. Smith, P.; Heath, D. (Dep. Pathol., Univ. Liverpool, Liverpool, England). **Paraquat lung: a reappraisal.** *Thorax 29(6): 643-653; 1974.* (20 references)

The lungs from four human cases of paraquat poisoning were examined histopathologically. In two, there was a dense mass of fibroblastic tissue which obliterated the lung architecture, and one of these showed an extensive deposit of collagen with honeycomb change. In a third case, pulmonary fibrosis was less severe and could be demonstrated exclusively within the alveolar spaces. The fourth case showed earlier lesions of capillary congestion, alveolar edema, and hyaline membrane formation. Paraquat appears to produce the same effect on the human lung as on the rat lung, i.e., a diffuse, cellular, intra-alveolar fibrosis. The intra-alveolar origin of this fibrosis is often obscured in the advanced stage of the disease and has been misinterpreted as fibrosing alveolitis. This fibrosis is associated with a pulmonary vascular disease. In assessing the histopathology of the lung in paraquat poisoning, a history of oxygen therapy must be taken into account; prolonged exposure to this gas may in itself produce pulmonary fibrosis.

75-1060. Stevens, W.; Van Peteghem, C.; Heyndrickx, A.; Barbier, F. (Dep. Med., State Univ. Ghent, Belgium). **Eleven cases of thallium intoxication treated with Prussian blue.** *Int. J. Clin. Pharmacol. Ther. Toxicol. 10(1): 1-22, 1974.* (92 references)

The results of Prussian blue use as a therapeutic agent in 11 cases of thallium intoxication are presented. The patients, 3 men and 8 women, aged 2-64 yr, included 3 cases of suicide, 3 of accidental intake, and 3 or unknown but probably criminal nature. Various methods of treating thallium intoxication are reviewed, including the use of sulfur-containing amino acids and other sulfated compounds, metal chelating drugs, EDTA and related salts, dithizone, sodium diethyldithiocarbamate, potassium chloride, and dialysis. In these 11 patients, colloidal or soluble Prussian blue was administered by duodenal intubation in 3 patients, p.o. in the others. No side effects of the treatment were noted. Clinical results were very good in the 4 patients who were treated soon after ingestion. None developed the clinical picture of thallotoxicosis, even though doses as high as one gram were taken. Notable subjective and objective amelioration still occurred in most of the other patients. In one patient, gait and vision remained disturbed due to irreversible damage before starting therapy. It is noted that fecal elimination largely exceeded urinary elimination. The following plan of treatment is presented. In acute intoxication gastric

lavage must be done as soon as possible; Prussian blue may be used. Gastric fluid should be examined to determine the absorbed dose. Treatment with 250 mg/kg Prussian blue daily, in 4 divided doses, dissolved in 50 ml 15% mannitol is to be started at once. Constipation must be avoided. Magnesium sulfate or clysmata are indicated if constipation develops. High doses of potassium chloride should be given i.v. during the first days of treatment, when kidney function is normal. If Prussian blue is not available, activated charcoal (0.5 g/kg, twice daily) and potassium chloride (3 to 5 g daily as a p.o. solution) can be used. Hemodialysis is of interest during the first hours in very acute intoxications, when renal function is impaired.

See also **75-1057**

75-1061. Petrella, V. J.; Hartgrove, R. W.; Fox, J. P.; Webb, R. E. (Virginia Polytech. Inst. and State Univ., Blacksburg, VA 24061). **Identification of the metabolites of endrin in endrin-resistant and susceptible pine mice.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 33(3): 219; 1974.*

Characterization of endrin resistance in pine mice has included in vivo and in vitro studies as well as structural analysis of metabolites. Oral dosing at equal and equitoxic levels of ^{14}C-endrin resulted in production of one fecal (F-1) and up to three urinary (U-1, 2, and 3) metabolites. None of the resistant (R) groups excreted U-3, and this represented the sole qualitative strain difference. When dosed equally, the R strain produced twice as much F-1 and U-2 (major metabolic forms) as compared to the susceptible (S) strain. At equitoxic levels, the R and S strains excreted equal quantities of F-1, but the R produced 1.6 times as much U-2 as the S. In vitro studies using hepatic microsomes showed an increased ability of the R strain to convert endrin to a single product (L-1). Metabolites F-1, U-2, and L-1 were identified as 12-OH-endrin. Tentative structural assignments for U-1 and U-3 were necessitated because of limited sample availability. It is suggested that U-1 is one of four possible tertiary alcohols of endrin, and U-3 is one of two possible cyclic hemiketals. These studies support the contention that endrin metabolism and thus excretion is a functional difference between the R and S strains and may play a part in the resistance mechanism. (Author abstract by permission)

75-1062. Davison, K. L.; Cox, J. H. (Agric. Res. Serv., Metab. Radiat. Res. Lab., Fargo, ND 58102). **Some effects of mirex on chickens, quail, and rats.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 33(3): 220; 1974.*

Mirex, a chlorinated hydrocarbon insecticide, did not affect egg production or egg weight when fed at 0, 5, 10, 20, 40, 80, and 160 ppm to white leghorn hens for 12 weeks. Thickness, weight, and calcium of eggshells were not affected when mirex was fed. Similar results were obtained when Coturnix quail were fed mirex for an equal period of time at 0, 5, 20, and 80 ppm. In either chickens or quail, dietary mirex did not affect liver weight, aniline hydroxylase and aminopyrine *N*-demethylase activities of hepatic microsomes, or cytochrome P-450 concentration in hepatic microsomes. In contrast, livers of Sprague-Dawley rats fed mirex at 100 ppm for 4 weeks weighed more than 2 times as much as the livers of control rats. In rats, dietary mirex did not affect aniline hydroxylase and aminopyrine *N*-demethylase activities of hepatic microsomes, but it did cause increased concentrations of cytochrome P-450. (Author abstract by permission)

75-1063. French, J. E. (North Carolina State Univ., Raleigh, NC 37607). **Some effects of *p,p'*-DDT on the flagellated protozoan, *Crithidia fasciculata*.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 33(3): 220; 1974.*

The feasibility of using *C. fasciculata* in DDT-cell interaction studies and the effects of DDT on cell population growth, energy metabolism, and protein and nucleic acid synthesis were studied. Cell population growth as measured by cell density and cell protein was significantly depressed. Exposure to 10 and 1408 nmole/ml caused 10 and 50% growth inhibition, respectively. Maximum uptake of ^{14}C-*p,p'*-DDT occurred after 6 hours exposure when DDT concentration was limited (1 nmole/ml). Distribution of DDT decreased per μg protein after 6 hours exposure. No effects on energy metabolism could be discerned, but significant inhibition of uptake and incorporation of thymidine and uridine occurred after 6 hours exposure to DDT. Inhibition was transient and characterized by an increase in thymidine uptake and incorporation and uridine uptake but not incorporation after 12 and 24 hours exposure. Leucine uptake and incorporation was not affected after 6 hours exposure. Uptake, but not incorporation increased after 12 and 24 hours exposure. Specific activities of ATP pool and RNA synthesis increased over controls after 6 and 24 hours exposure to DDT. It is concluded that growth inhibition of *C. fasciculata* is at least partially due to inhibition of nucleic acid precursor uptake, but not incorporation. Cellular ability to regulate uptake is altered or membrane permeability changes after exposure to DDT. (Author abstract by permission)

75-1064. Haley, T. J.; Harmon, J. R.; Dooley, K. L.; Uhler, R. (NCTR, Jefferson, AR 72079). **Comparison of the oral LD01 of carbaryl and dichlorvos.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 33(3): 220; 1974.*

LD50s were obtained for carbaryl and dichlorvos utilizing computer based balanced and unbalanced probit methods; values were males 104.3 (93.4-132.2), females 115.3 (104.4-135.7) and males 144.6 (131.0-170.9), females 147.4 (133.7-198.4) mg/kg, respectively. LD015 were carbaryl males 52 (40.7-58.3), females 69.1 (59.6-75.9) and dichlorvos males 84.1 (75.0-90.6) females 95 (78.7-101.5) mg/kg. From this data, extrapolated LD001s were obtained; carbaryl males 41.4 (28.1-49.2), females 58.4 (46.9-66.1) and dichlorvos males 70.4 (58.9-78.1), females 82.2 (58.6-91.9) mg/kg. Dose-response curves were parallel in all cases and there were no significant differences between the sexes. Carbaryl was significantly more toxic than dichlorvos at all doses. (Author abstract by permission)

75-1065. Farmer, J. (Natl. Cent. Toxicol. Res., Jefferson, AR 72079). **Comparison of probit and logit models for estimation of LD01.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 33(3): 220; 1974.*

Considerable discussion has occurred concerning the appropriateness of the probit or logit model for point estimation of the low end of the dose response curve for quantal response data. Experiments were

designed to allow an estimate of the slope of the curve and the unbalanced design, with large groups of animals at the low dose range, to allow an estimation of the LD01 by both the probit and logit models. The LD50 was obtained with 100 mice of the same sex and the data was used to predict doses to be used in the LD01 study using 720 mice. Aprocarb (*o*-isopropoxyphenylmethylcarbamate, propoxur) administered orally to female mice was used for comparison of the two statistical models. The chi square (5 difi) goodness of fit for the probit model was 6.34 and for the logit model was 7.52. Neither was significant and both models adequately represent the data. The probit estimate of the LD01 was 22.2 (18.1-24.8) mg/kg and logit estimate was 21.3 (16.1-24.5) mg/kg with the former giving the smaller 95% confidence interval for the estimate. Conclusions from several experiments indicate that an unbalanced design provides the best estimate of the LD01 and both models are indistinguishable in the response range between 1 and 99%. (Author abstract by permission)

75-1066. Miller, D. S.; Peakall, D. B.; Kinter, W. B.; Risebrough, R. W. (Mount Desert Island Biol. Lab., Salsbury Cove, ME 04672). **Minimal DDE effects on plasma osmoregulation and nasal gland Na-K ATPase in ducks.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 33(3): 220; 1974.*

Friend, Haegele, and Wilson recently reported (*Bull. Environ. Contam. Toxicol. 9:49; 1973*) that a diet of 10 ppm DDE (2,2-bis-(*p*-chlorophenyl)-1, 1-dichloroethylene) for 1-9 days was sufficient to suppress the volume of salt gland secretion in 5-month old male mallards (*Anas platyrhynchos*) not previously exposed to salt. Our initial experiments with white Pekins (domesticated mallards) showed such variable nasal gland function in response to i.v. salt loading that no definite effects could be seen even at 100 ppm DDE. Detailed studies were made of plasma electrolytes and osmolality and nasal gland and kidney ATPase in 3-5 mo Pekin and mallard ducks fed 10-100 ppm DDE in dry meal (donated by Agway) and maintained 7 d on fresh water plus 2-19 d on 60 or 100% sea water (SW). Representative wet weight residue values were: nasal gland 11, kidney 6, liver 16, and brain 2 ppm DDE in Pekins (n=4) fed 100 ppm for 15 d total. Although DDE fed birds on SW, particularly males, tended to show somewhat higher plasma sodiums and osmolalities, differences from non-DDE fed controls were rarely significant ($P<0.05$). Also only in mallards after 19 d on 100% SW did 100 ppm dietary DDE significantly inhibit (22%) nasal gland, but not kidney, Na-K ATPase. Thus, neither the Pekin nor its wild forbear are sensitive enough to demonstrate conclusive effects on plasma osmoregulation or nasal gland ATPase at environmental DDE levels. (Author abstract by permission)

75-1067. Davies, D. S.; Davies, D. L. (Royal Postgrad. Med. Sch., London, England). **Effect of *d*-propranolol and superoxide dismutase on paraquat reduction and adrenochrome formation by rat liver microsomes.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 33(3): 228; 1974.*

Paraquat (Pq), a widely used contact herbicide, is extremely toxic in man when ingested and is thought to have caused 172 deaths in the last 9 years. Death is usually due to respiratory insufficiency caused by a late developing pulmonary fibrosis. It is possible that the lung lesion is due to the damaging effects of superoxide (O_2^-) generated by the reduction of Pq to a radical ion in the presence of O_2. Consequently patients in the hospital have recently been treated for Pq poisoning with a combination of superoxide dismutase (SOD) and *d*-propranolol (Pr). To evaluate the effect of SOD and Pr on O_2^- generation, studies were carried out with rat liver microsomes. Oxidation of adrenalin to adrenochrome was used to monitor O_2^- production. Anaerobically, liver microsomes with added NADPH reduced Pq to the intensely blue Pq radical ion. Pr (5 m*M*) caused a 58% inhibition in the rate of reduction to Pq. In air, liver microsomes and NADPH oxidized adrenalin (1.6 m*M*) to adrenochrome in the absence of Pq. Addition of Pq (4.8 m*M*) caused a 50% increase in the rate of adrenochrome formation. SOD (5 μg/ml) prevented adrenochrome formation in the absence of Pq and caused a 60% inhibition in the presence of Pq (4.8 m*M*). Thus Pr and SOD act at different stages to reduce the availability of O_2^-. The relevance of this data to the lung damage caused by Pq is being investigated. (Author abstract by permission)

75-1068. Srinivasan, R.; Karczmar, A. G.; Bernsohn, J. (Dep. Pharmacol., Loyola Univ. Med. Cent., Maywood, IL 60153). **Synthesis of acetylcholinesterase (AChE) in rat brain nerve endings.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 33(3): 478; 1974.*

Synthesis of brain AChE in various subcellular fractions was studied in 20 and 58 day old rats following intracerebral injection of diisopropyl phosphofluoridate (DFP). In 20 day old rats DFP, 140 μg total dose, inhibited AChE activity of the nerve ending and microsomal fraction by 60 and 76% compared to control values, respectively. On day 15 following DFP, AChE inhibition in nerve endings and the microsomes decreased to 13 and 35%, respectively. When corrected for ontogenetic increase of AChE, the increment in enzyme activity following DFP administration amounted to 83% in nerve endings and to 40% in the microsomes. In 58 day old rats DFP, 500 μg total dose, inhibited the microsomal and the nerve ending AChE by 80 and 86%, respectively. After 20 days AChE activity of the nerve endings and of the microsomes was 77 and 66% of control, respectively. This data suggests the nerve terminal site of synthesis of AChE. When Triton X-100 was used to solubilize AChE the inhibition due to DFP was considerably less in nerve terminals and in micro-

somes compared to the DFP inhibition measured in buffer-treated fractions. These results suggest that a reservoir of the enzyme is not available to substrate and to inhibitors such as DFP. (Author abstract by permission)

75-1069. Pritchard, J. B. (Med. Univ. of South Carolina, Charleston, SC 29401). **Active transport of DDA by renal tubules in vitro.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 33(3): 514; 1974.*

The major form of DDT excreted in the urine of most vertebrates is DDA [2,2-bis(*p*-chlorophenyl)-acetic acid]. On the basis of its structure, DDA is a likely substrate for the organic acid transport system of the kidney. This possibility was investigated by incubating small masses (1-2 mg) of flounder (*P. lethostigma*) tubules in 1 ml of oxygenated fish saline for periods to 1 hr with $10^{-5}M$ ^{14}C-DDA. Tissue to medium ratios of 10 or more were reached by one hr. Metabolic inhibitors reduced total uptake by nearly 40%. The fraction of the uptake sensitive to metabolic inhibition was strongly inhibited by organic acids in a concentration-dependent manner. Chlorophenol red (CPR) and *p*-aminohippuric acid (PAH) inhibited 75-85% of the active uptake at $10^{-3}M$. At $10^{-3}M$ PAH had no effect on the fraction insensitive to metabolic inhibitors and CPR reduced this component only 16%. Tissue binding, when measured in vitro by centrifugation of tubule homogenates, showed a similar lack of inhibition by PAH and slight reduction by $10^{-3}M$ CPR. Thus, the renal tubule accumulates DDA both by active transport and a second mechanism, probably nonspecific tissue binding. (Author abstract by permission)

75-1070. Ecker, J. L.; Gibson, J. E.; Hook, J. B. (Dep. Pharmacol., Michigan State Univ., East Lansing, MI 48824). **Effect of the herbicide paraquat (methyl viologen) on renal organic cation transport.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 33(3): 520; 1974.*

Paraquat, at low doses in man and animals, produces lesions in the lung and renal proximal tubule. Disappearance of paraquat from the plasma occurs in an apparent biphasic mode, with a rapid initial component followed by a very slow component of elimination. Paraquat is similar in structure to several organic bases which are known to be actively secreted by the proximal tubule. To investigate the renal handling of paraquat, its effect on steady state uptake of a prototype organic base, *N*-methylnicotinamide (NMN), was determined. Thin slices of renal cortex were prepared free hand from mouse kidneys and incubated in a physiological medium containing $6.0\times10^{-6}M$ ^{14}C-NMN at 25°C in an atmosphere of 100% oxygen. Various concentrations of paraquat were added to the medium. Results were expressed as the final concentration of NMN in the slices factored by the concentration in the medium. The control NMN S/M value of 12.38 was not significantly different from the S/M ratios obtained with $10^{-7}M$, $10^{-6}M$ and $10^{-5}M$ paraquat (11.36, 12.20 and 11.98, respectively. The S/M ratios with $10^{-4}M$ and $10^{-3}M$ paraquat of 9.19 and 4.62, were significantly less than control. These results are consistent with the initial fast component of elimination being due in part to active secretion of the drug via the organic base transport system of the kidney. (Author abstract by permission)

75-1071. Lucier, G. W. (Natl. Inst. Environ. Health Sci., NIH, Research Triangle Park, NC 27709). **Nature of the enhancement of hepatic UDP glucuronyltransferase activity by 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in rats.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 33(3): 533; 1974.*

Following single low level oral doses (1 μg/kg) of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) to rats, hepatic microsomal *p*-nitrophenol (PNP) glucuronyltransferase activity was elevated approximately 6-fold whereas glucuronidation rates of testosterone and estrone were unaffected. The elevation of PNP glucuronyltransferase was still present 73 days after 25 μg TCDD/kg, and female rats were more susceptible to TCDD actions on glucuronyltransferase than males. The effects of TCDD treatment on PNP glucuronyltransferase appeared to be related to increased amounts of liver enzyme for the following reasons: (1) *K*m values for PNP and UDPGA were unchanged; (2) the magnitude of the TCDD-induced increase of PNP glucuronyltransferase activity was the same whether enzyme activity was measured in the presence or absence of Mg^{++} or Triton X-100; (3) TCDD, in vitro, had no detectable effect on enzyme activity; (4) TCDD treatment of rats did not change either the total hepatic microsomal phospholipid or cholesterol contents; (5) pH optima were unchanged; (6) solubilization and purification of enzyme was not accompanied by a change in the TCDD induction effect; (7) actinomycin D appeared to block the initial phase of induction. (Author abstract by permission)

75-1072. Mehendale, H. M.; El-Bassiouni, E. A.; McKinney, J. D. (Natl. Inst. Environ. Health Sci., NIH, Research Triangle Park, NC 27709). **Disposition of aldrin by isolated perfused rabbit lung preparations.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 33(3): 534; 1974.*

Isolated perfused lung preparations were used to study the uptake, metabolism and disposition of aldrin. After the initial rapid uptake of aldrin, a steady-state was established in the lung with respect to the net uptake. The lung preparations converted aldrin to its epoxide, dieldrin, and the epoxide appeared in the perfusion medium within the first 3 minutes after the addition of aldrin. The concentration of dieldrin in the perfusion medium increased with time with a corresponding decrease in the concentration of aldrin. However, the total of aldrin and dieldrin in the perfusion medium remained constant after the initial phase of

rapid uptake and the subsequent steady-state was established. The metabolic capability of the lung increased with age of the animal, the largest increase occurring between 2 to 6 weeks with the activity leveling off at 16 to 22 weeks of age. Edema and failure of the lung resulted within 20 minutes after the lung was challenged with $4X10^{-6}M$ aldrin. Present evidence indicates that lung extracts this lipophilic chlorinated cyclodiene compound from the perfusion medium and is capable of metabolizing it and accumulating it over 10 times its concentration in the circulating perfusion medium. (Author abstract by permission)

75-1073. Hodgson, J. R.; Castles, T. R.; Murrill, E.; Lee, C. C. (Midwest Res. Inst., Kansas City, MO 64110). **Distribution, excretion and metabolism of the fungicide ferbam in rats.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 33(3): 537; 1974.*

Approximately 50% of the radioactivity in a single oral dose of ferbam-^{35}S or ferbam-^{14}C suspended in 0.5% CMC was absorbed through the gastrointestinal tract in the first 24 hr. In rats receiving ferbam-^{35}S, 18%, 23%, and 1.0% of the ^{35}S was found in expired air, urine, and bile, respectively during the 24 hr period. Only small amounts of ^{35}S were found in the various tissues including blood, kidneys, muscle, and brain. In rats receiving ferbam-^{14}C, <0.1%, 43%, and 1.4% of the ^{14}C was found in the expired air, urine, and bile, respectively, during the first 24 hr. The other tissues contained only small amounts of ^{14}C. In pregnant rats given ^{14}C-ferbam, a small amount of ^{14}C readily crossed the placenta and accumulated in fetuses. In addition, ^{14}C was secreted into milk of lactating rats. Analysis of urine and bile from ferbam-treated rats by thin-layer chromatography demonstrated radioactive compounds which do not correspond to ferbam or any of the known degradation products of ferbam. Major metabolites appear to be conjugates of dimethyldithiocarbamic acid as indicated by chemical and infrared spectroscopic analyses for functional groups. (Author abstract by permission)

75-1074. Lee, O. S.; Feller, D. R. (Div. Pharmacol., Coll. Pharm., Ohio State Univ., Columbus, OH 43210). **Effect of chlordane and metyrapone pretreatment on the biliary excretion and binding of 2-acetylaminofluorene to liver ribosomal-RNA in rat.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 33(3): 574; 1974.*

The influence of pretreatment with chlordane and metyrapone on the biliary excretion and binding of 2-acetylaminofluorene (2-AAF-9-^{14}C) to liver ribosomal-RNA (r-RNA) was investigated in male rats. Control and drug-treated animals were anesthetized, the bile duct cannulated, and given a single dose of 2-AAF (5 mg/kg, i.v.). Chlordane pretreatment (25 mg/kg for 3 days) increased the biliary excretion of polar metabolites of 2-AAF and significantly reduced the binding of ^{14}C to liver r-RNA. These findings were correlated with diminished levels of ^{14}C found in blood and liver of animals given chlordane as compared to controls. By contrast, treatment with a single dose of metyrapone (60 mg/kg, i.p.) significantly lowered the biliary excretion of ^{14}C throughout the 90 min period after administration of the carcinogen. At 90 min, the amounts of ^{14}C present in blood, liver and isolated liver r-RNA were only slightly higher in metyrapone-treated animals when compared to control animals. The results indicate that hepatic microsomal metabolism plays a major role in the biliary excretion of 2-AAF and metabolites and that acceleration of biotransformation reactions by prior administration of the hepatic enzyme inducer, chlordane, can markedly reduce the degree of carcinogen binding to liver nucleic acids. (Author abstract by permission)

75-1075. Sternberger, L. A.; Cuculis, J. J.; Meyer, H. C.; Lenz, D. E.; Kavanagh, W. G. (Immunol. Branch, Edgewood Arsenal, MD 21010). **Antibodies to organophosphorus haptens: immunity to paraoxon poisoning.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 33(3): 728; 1974.*

Rabbits injected with *O,O*-diethylphosphoryl-*O*"-*p*-phenyl-azo)$_{100}$ hemocyanin without adjuvants form antibodies reactive with the homologous ligand, paraoxon, but not with the heterologous organophosphates, sarin, soman, or *O*-ethyl, *S*-(2-diisopropylaminoethyl) methylphosphonothioate. Most rabbits possess high levels of antibodies and survive asymptomatically after repeated subcutaneous injections of three LD50s of paraoxon (1 mg/kg), while nonimmunized control rabbits die within minutes and nonimmunized rabbits protected with atropine and oxime become temporarily asphyxiated. Rabbits with low levels of antibodies contract symptoms but survive longer than controls. No immunized rabbits without measurable levels of antibody have been encountered. Antibodies were determined by radioimmunoassay with ^{3}H-paraoxon or by an adaptation of the unlabeled antibody enzyme method from cytochemistry to serology. (Paraoxonyl-azo)$_6$ albumin-conjugated putrescyl-Sepharose was treated with diluted antisera followed by sheep antirabbit IgG, peroxidase-antiperoxidase complex and reaction with *o*-dianisidine and hydrogen peroxide. Although the degree of protection to poisoning correlated with levels of specific antibodies, their amounts and avidities were insufficient to "neutralize" all the paraoxon injected. (Author abstract by permission)

75-1076. Maling, H. M.; Saul, W.; Williams, M. A.; Brown, E. A. B.; Gillette, J. R. (Natl. Inst. Health, Bethesda, MD 20014). **Propranolol treatment of experimental paraquat poisoning in rats.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 226; 1975.*

Accidental ingestion of paraquat (Pq), a widely used herbicide, has caused more than 200 deaths from lung damage during the past decade. The effects of

various treatments on Pq poisoning in male Sprague-Dawley rats have been evaluated. In 48 hr, there were 34 deaths among 48 rats injected i.p. with Pq (25 mg/kg) and treated with control s.c. saline injections. Only 17 rats died from Pq among 48 rats treated with repeated doses s.c. of *d,l*-propranolol. Treatment with l-propranolol was almost as effective (21 deaths in 48 rats) as treatment with *d,l*-propranolol; *d*-propranolol was less effective (28 deaths in 48 rats). Other β-adrenergic receptor blocking agents (Ko 592[1-(3-methylphenoxy)-3-isopropylaminopropanol (2)-hydrochloride], sotalol, bunolol) also seemed to reduce the mortality from Pq. Mortality was increased by treatment with theophylline or l-isoproterenol. These findings suggest an involvement of the beta adrenergic receptor. Uptake in vitro of (methyl-^{14}C) Pq by lung slices (Rose, Smith and Wyatt, *Nature*, 252-314, 1974) was competitively inhibited not only by propranolol (Rose, personal communication), but also by other beta adrenergic blocking agents (pronethalol, dichloroisoproterenol, Ko 592, bunolol). Inhibition of Pq uptake may partially explain the reduction in Pq mortality by treatment of rats with propranolol or other beta adrenergic receptor blocking agents. (Author abstract by permission)

75-1077. Brown, E. A. B.; Maling, H. M. (NIH, Bethesda, MD 20014). **The effects of paraquat and related herbicides on the acetylcholinesterase of rat lung.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 226; 1975.*

Paraquat (1,1'-dimethyl-4,4'-bipyridinium dichloride; Pq) is a quaternary nitrogen compound in common use as a herbicide. In the past 10 years, more than 200 deaths from pulmonary damage have been caused by this compound. A general property of diquaternary amines is the inhibition of acetylcholinesterase (ACE). Inhibitors of ACE can cause edema of the lungs; therefore, we examined 3 bipyridylium herbicides (Pq, diquat, and morfamquat) for their ability to inhibit lung ACE from male Sprague-Dawley rats. ACE was determined by the method of Ellman et al. (*Biochem. Pharmacol.* 7: 89, 1961) with acetylthiocholine bromide as substrate. Inhibition was shown to be competitive by the method of Dixon. The apparent *Ki* were $2.9\times10^{-3}M$ for Pq, $2.4\times10^{-4}M$ for diquat and $1.4\times10^{-4}M$ for morfamquat. Since some ACE inhibitors also block the neuromuscular junction, we observed the effects of Pq in chicks. Depolarizing agents cause extensor paralysis and competitive blocking agents produce a flaccid paralysis in chicks. The i.p. injection of Pq (15 mg/kg) produced extensor paralysis and death within 6 hr; no obvious changes occurred after 10 mg/kg. A subthreshold dose of *d*-tubocurarine chloride (1.5 mg/kg) produced a transient flaccid paralysis when administered 90 min after 10 mg/kg Pq. These observations suggest that Pq can produce a dual-block of neuromuscular function (Paton and Zaimis, *Pharmacol. Rev.* 219, 1952). (Author abstract by permission)

75-1078. Peoples, S. A.; Westberg, G. L. (Sch. Vet. Med., Univ. California, Davis, CA 95616). **The selective nephrotoxicity of 3-chloro-*p*-toluidine (CPT) and 2-chloro-4-acetotoluidine (CAT) is due to a difference in the metabolic handling of both compounds by the two species.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 227; 1975.*

CTP and its *N*-acetyl metabolite CAT cause death by renal failure in birds but not in mammals, making them avicides without the hazard of secondary toxicity. The purpose of this study then was to determine whether this specific toxicity was due to a difference in the metabolic handling of CPT and CAT in the respective species. Chickens and rats were fed either CPT or CAT at 15 mg/kg and 250 mg/kg respectively and groups were sacrificed at intervals over a two hour period. Their kidneys were then analyzed for CPT, CAT, and two other metabolites common to each–CPT-C (4-acetamino-2-chlorobenzoic acid) and CPT-D (4-amino-2-chlorobenzoic acid) as follows: CPT and its metabolites were extracted from hydrolyzed aqueous material at pH 3.4 and 9.0 with ethyl ether. The combined ethyl ether extracts were concentrated and methylated with diazomethane. The methylated extract was cleaned up using Florisil column chromatography and the resulting eluant was further concentrated and subjected to GLC equipped with a chloride specific Coulson electrolytic conductivity cell. Excellent separation of the compounds was achieved with a sensitivity of about 0.70 ppm for each. Results revealed that the kidney of the chicken dosed with either CAT or CPT contains CPT and CPT-D only, whereas the kidney of the rat, similarly dosed, contains predominantly the compound administered with smaller amounts of the other metabolites also present. (Author abstract by permission)

75-1079. Haley, T. J.; Farmer, J. H.; Dooley, K. L.; Harmon, J. R. (NCTR, Jefferson, AR 72079). **Comparison of low dose acute oral toxicity of trichlorfon and fospirate.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 245; 1975.*

Previously it was shown that it is possible to accurately determine the LD01 and extrapolate the LD001 for five methylcarbamate pesticides (*Eur. J. Toxicol.* 7: 153, 1974). Similar studies have been undertaken with trichlorfon and fospirate, two organophosphate pesticides. LD50s were determined for trichlorfon and fospirate utilizing computer based balanced and unbalanced probit methods. Values were males and females 800 (741-864) and males 225 (206.4-245.3) and females 263 (248.1-278.8) mg/kg respectively. LD01s were trichlorfon males 430.23 (381.81-463.5), females 458.28 (390.4-503.35) and fospirate males 121.02 (100.09-133.93), females 157.57 (145.01-165.88) mg/kg. From this data extrapolated LD001s were obtained, trichlorfon males 362.18 (301.16-402.06), females 371.85 (284.96-425.33) and fospirate males 93.87 (66.92-109.92), females 139.7 (123.17-150.41)

mg/kg. The slopes of the lines in the LD50 determinations were parallel for both compounds but in the LD01 experiment those for fospirate were not due to an unexpected high death rate (90%) at a dose expected to produce only a 64% response. Fospirate was significantly more toxic than trichlorfon at all doses and was also more toxic to males than females. (Author abstract by permission)

75-1080. Harbison, R. D.; Koshakji, R. J. (Dep. Pharmacol., Cent. Toxicol., Vanderbilt Med. Cent., Nashville, TN 37232). **Studies of the mechanism of increased susceptibility of the newborn to parathion toxicity.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 245; 1975.*

Newborn rats are about 5 times more susceptible to parathion (PTH) toxicity than adults. Newborn rat and mouse plasma and brain cholinesterase levels are significantly lower than adult cholinesterase levels. Plasma and brain cholinesterase levels reached adult levels 20 to 30 days postpartum. Metabolic conversion of PTH to paraoxon (PO), diethyl phosphate (DEP), and diethyl phosphorothionate (DEPT) was measured in vitro using liver microsomes. Metabolism of PTH by newborn rat liver microsomes was significantly depressed when compared to adult. The rate of conversion of PTH to PO increased with increasing age and reached adult rates at about 30 days postpartum. A 2.5 fold increase in *V*max from day 1 postpartum to adult was noted. Similarly the rate of conversion of PTH to DEP and DEPT increased with age. However, direct conversion of PTH to DEPT remained a minor quantitative pathway throughout development. The *K*m for all pathways studied was significantly higher at day 1 postpartum when compared to adult. Newborn rats are also more susceptible to PO toxicity than adults. Phenobarbital pretreatment antagonizes PTH- and PO-induced toxicity by significantly increasing metabolism of PTH to PO and DEPT as well as increasing paraoxonase activity. The combination of depressed paraoxonase activity and depressed cholinesterase activity increases the susceptibility of the newborn to PTH- and PO-induced toxicity. (Author abstract by permission)

75-1081. Padgett, G.; Bell, T. G.; Farrell, K. (Coll. Vet. Med., Washington State Univ., Pullman, WA 99163). **Dichlorvos flea collar ataxia-depression and dermatitis in the laboratory cat.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 245; 1975.*

Forty-two percent of 50 laboratory cats wearing commercial flea collars impregnated with 2,2-dichlorovinyl dimethyl phosphate (dichlorvos or DDVP) in a warm dry environment exhibited an ataxia-depression syndrome. Eight percent of the affected cats died. Whole blood cholinesterase (ChE) was significantly reduced in all dichlorvos-collared cats. Cervical dermatitis occurred in 74% of dichlorvos-collared cats. Cats tested in a warm humid environment exhibited no abnormalities. Seventy-four cats wearing placebo collars (either polyethylene or polyvinyl chloride) exhibited no abnormalities. A CCl^4 liver dystrophy produced experimentally had no effect on either control cats or dichlorvos exposed cats. The predominant systemic abnormality recorded in cats exposed to dichlorvos consisted of an ataxia-depression syndrome which is indistinguishable from the syndrome produced by exposure of cats to classically neurotoxic organic phosphates such as tri-*o*-cresyl phosphate. These observations are discussed in relation to previous studies having cleared dichlorvos as a neurotoxic agent. (Author abstract by permission)

75-1082. Hazelwood, J. C.; Wagstaff, D. J.; Phillips, R. W. (BVM, FDA, Beltsville, MD 20705). **Electromyographic analysis of organophosphate (O.P.) exposure in the dog.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 245; 1975.*

Classically, exposure to O.P. cholinesterase inhibitors has been monitored by measuring the activity of cholinesterase in the blood. However, blood enzyme alterations have not proven to be an effective method for detecting subclinical changes. This study was instituted to develop a more reliable means of assaying O.P. exposure. Skeletal muscle evoked potentials were analyzed in anesthetized beagle dogs using a storage oscilloscope. After a therapeutic dose of an organophosphate vermicide blood cholinesterase levels did not change and there were no clinical signs of neuromuscular dysfunction. However, the strength duration curve was shifted toward lower voltages in treated dogs. At shorter duration, voltage in control dogs was 15.3 ± 7.0 V compared to 6.0 ± 2.8 V in treated dogs. When the duration of the stimulus was increased, voltage in controls was 1.5 ± 0.7 V and in treated dogs was 0.7 ± 0.1 V. Also, the O.P. treated dogs consistently had afterdischarges, i.e., erratic low amplitude electromyographic activity following the normal evoked action potential. The changes noted are in accord with the generally accepted theory that organophosphates decrease cholinesterase activity at the myoneural junction causing an increased sensitivity to electrical stimulation. (Author abstract by permission)

75-1083. Koschier, F.; Berndt, W. O. (Dep. Pharmacol., Univ. Mississippi Med. Cent., Jackson, MS 39216). **In vitro uptake of organic ions by renal cortical tissue of rats treated chronically with 2,4,5-trichlorophenoxyacetic acid.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 246; 1975.*

Chronic administration of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) to rats of the Wistar strain altered the active transport of several organic ions by renal cortical slices. Rats received daily subcutaneous injections of 2,4,5-T (20-50 mg/kg) for 9-16 days. The in vitro accumulation of organic acids and bases by rat

renal cortical slices was measured 48 hours after the final 2,4,5-T injection. The pretreatment procedure either enhanced or reduced the accumulation of organic ions by renal cortical slices. These changes in transport are dependent on the duration of tissue incubation at 25°C and 100% oxygen, duration of 2,4,5-T pretreatment, age of the animals, and addition of metabolic substrates to the incubation medium. Changes in uptake of organic ions in the treated rats do not depend on chronic accumulation of a body store of 2,4,5-T. Rats which received daily subcutaneous injection of radiolabeled material (20 mg/kg and 0.5 μC/kg) for 16 days excreted 86.7% of the total dose in the urine and 4.4% in the feces. Eighteen days after the first injection, only 1-1.5% of the total dose remained in the animal. It is concluded that chronic exposure to 2,4,5-T in rats alters the tubular transport of organic ions without alterations in the gross excretion of 2,4,5-T. (Author abstract by permission)

75-1084. Lee, H. M.; Visek, W. J. (Dep. Animal Sci., Cornell Univ., Ithaca, NY 14853). **Sexual differentiation of the brain in male rats given *o,p'*-DDT at birth.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 246; 1975.*

Male rats given 3 mg 1-(*o*-chlorophenyl)-1-(*p*-chlorophenyl)-2,2,2-trichloroethane (*o,p'*-DDT) in a single s.c. injection 1-3 hr after birth were castrated at 3 mo and had ovarian tissue from immature female rat implanted in the anterior eye chamber. Corpora lutea were evident 20-60 d later. Of 19 treated rats, 14 formed large corpora hemorrhagica and 5 of these 14 developed corpora lutea. In 20 negative controls given only the vehicle, a small corpus hemorrhagicum formed in only one rat. Eleven of 18 positive controls, castrated 4-10 hr after birth and implanted with ovarian tissue at 3 mo developed corpora lutea in the transplanted ovary. A rhythmic neural mechanism regulating gonadotrophic secretion, as in the female, was possibly induced by neonatal injection of *o,p'*-DDT in the male. Interference by *o,p'*-DDT with development of a normal male pattern of brain sexual differentiation was probably due to inhibition of the normal action of testosterone. In vitro studies show that association of 7-^{3}H-testosterone (1.87 n*M*) with the specific 8S receptor protein from the cytosol of a 40% homogenate of the hypothalamic region of the brain from 280-300 g male rats 20 hrs after castration, is inhibited 70% by 4.15 ppm (14.6 μ*M*) and 100% by 6 ppm (21.2 μ*M*) *o,p'*-DDT as assayed by the method of sucrose-glycerol concentration gradient ultracentrifugation after charcoal-dextrin absorption. (Author abstract by permission)

75-1085. Campbell, K. L.; Mason, M. (Dep. Biol. Chem., Univ. Michigan, Ann Arbor, MI 48104). **Endocrine effects of neonatal exposure of male rats to *o,p'*-DDT.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 274; 1975.*

Heinrich et al. (*Science* 173; 642; 1971) reported an induction of persistent vaginal estrus and a reduction in uterine estrogen response and estrogen-binding capacity in rats injected neonatally with daily doses of 1 mg *o,p'*-DDT (2-(*o*-chlorophenyl)-2-(*p*-chlorophenyl)-1,1,1-trichloroethane). This study investigates the effects of similar injections of 0-400 μg/day on days 1 to 5 into neonatal male Sprague-Dawley rats. The higher dosage levels that have been tested caused decreases in adult body weight as well as changes in endocrine-associated organ weights. Effects on steroidogenesis are being tested. Preweaning exposure of neonatal males to dams injected with 50 mg *o,p'*-DDT daily during postnatal days 1 to 25 caused statistically significant alterations in body weight and in testes and ventral prostate weights (as % of body weight). It also caused significant changes in the adrenals, liver, and seminal vesicles (as % of body weight) in neonatally-castrated males when compared to appropriate controls. Radioimmunoassay of sera from adult males exposed prior to weaning to treated dams demonstrated an apparent diurnal depression of LH levels in comparison to controls exposed to vehicle-treated dams. (Author abstract by permission)

75-1086. Pritchard, J. B.; Karnaky, K. J.; Kinter, W. B. (Med. Univ. South Carolina, Charleston, SC 29401). **Renal tubular transport of DDA.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 408; 1975.*

The renal mechanisms controlling excretion of the polar DDT metabolite, DDA (2,2-bis[*p*-chlorophenyl] acetic acid) were studied in vitro and in vivo using the winter flounder, *Pleuronectes americanus*. In vitro incubation of teased renal tubules for 1 hr with ^{14}C-DDA produced tissue to medium ratios of 10-20. Uptake showed two components, one which was insensitive to metabolic inhibitors (probably tissue binding) and a second which required metabolic energy and was inhibited by organic acids. Autoradiography using ^{3}H-DDA demonstrated that the renal tubular cell cytoplasm contained the highest concentration of DDA. Tubular lumen contained somewhat less DDA than surrounding cells. Renal clearance studies showed net secretion of DDA in vivo, with clearances ranging from 10-40 times the glomerular filtration rate. Organic acids such as chlorophenol red and probenecid inhibited secretion. These results suggest that the major mechanism for excretion of DDA in the flounder is active uptake by the tubular cells on the organic acid transport system and passive exit down its concentration gradient into the tubular lumen. (Author abstract by permission)

75-1087. Hendrickson, C. M.; Bowden, J. A. (Dep. Biochem., Louisiana State Univ., Baton Rouge, LA 70803). **A proposed mechanism for the in vitro inhibition of NADH-linked dehydrogenases by halogenated hydrocarbon pesticides: evidence for an "association complex" for lactic acid dehydrogenase.**

Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 506; 1975.

A number of halogenated hydrocarbons (HHC) inhibit NADH-and FADH-dependent dehydrogenase in vitro; e.g., crystalline lactate dehydrogenase (M_4 isozyme) (LDH) is inhibited by pesticidal hydrocarbons, including mirex (dodecachlorooctahydro-1,3,4-metheno-2*H*-cyclobuta-[cd]-pentalene) which competitively inhibits LDH both with respect to pyruvate (PYR) and NADH; the apparent inhibition constants are 0.02 m*M* and 0.03 m*M* respectively. Based on the mechanism for LDH (ordered sequential BiBi) and results gained during this study (including data for related compounds), a mechanism for this inhibition has been proposed. This mechanism involves a reversible association of NADH and HHC to form a weak attraction or "association complex". The association of NADH with HHC hinders (1) formation of the LDH-NADH complex and (2) subsequent formation of the PYR-LDH-NADH ternary complex, resulting in competitive inhibition at both points. Change in UV and CD spectra of NADH in the presence of mirex, as well as evidence for a time-dependent association of NADH and HHC, substantiate this theory. These results and similar observations with other enzymes suggest that such compounds interact with NADH-related enzymes in vitro (cell free) in a similar fashion. (Author abstract by permission)

75-1088. Civen, M.; Brown, C. B. (Vet. Adm. Hosp., Long Beach, CA 90801). **Inhibition of adrenal cholesterol ester formation by organophosphate insecticides.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 664; 1975.*

Previous studies (Civen & Brown, *Pest. Biochem.* 4: 254; 1974) had shown that a variety of organophosphate insecticides inhibited rat adrenal steroidogenesis in vitro and in vivo. To further delineate the major site of action of these compounds, the uptake and esterification of oleic acid to form cholesterol oleate was studied in capsular (c) and decapsulated (d) adrenal cell suspensions. The cell suspensions were prepared by incubating tissue for 50 min. at 37° with collagenase albumin, Krebs Ringer-HCO_3 glucose solution. Cells were incubated for 2 hr with oleic acid-1-^{14}C (O), lipid fraction extracted, and separated by TLC (Brecher et al. *Endocrinology 93: 1163; 1973*). ACTH (β1-14) (1 ng/ml) produced a slight stimulation of oleic uptake into fatty acid fraction in both c and d cells (21 and 33% respectively). The addition of 2,2-dichlorvinyl dimethyl phosphate (dichlorvos, DDVP) (10^{-5}*M*) did not affect O uptake. However, the combination of ACTH and DDVP enhanced O uptake into c and d cells (53 and 56% respectively). ACTH depressed O incorporation into the cholesterol ester (CE) fraction in both c and d cells (29 and 47% respectively). DDVP also produced a depression of incorporation into the CE fraction (41% in both). ACTH and DDVP produced an 88% inhibition of O incorporation into the CE fraction in the d cells but only 49% in the c cells. These results indicate that DDVP, an organophosphate insecticide, interferes with cholesterol ester metabolism at concentration levels which inhibit adrenal steroidogenesis. (Author abstract by permission)

75-1089. Oberholser, K. M.; Wagner, S. R.; Passanati, G. T.; Greene, F. E. (Dep. Pharmacol., Hershey Med. Cent., Pennsylvania State Univ., Hershey, PA 17033). **Factors affecting the rate of metabolism of dieldrin by rat liver microsomes.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 725; 1975.*

Using a TLC method based on that of Matthews and Matsumura (*J. Agr. Food Chem.* 17: 845; 1969), factors affecting the metabolism of ^{14}C dieldrin by rat liver microsomes were studied. Four groups of metabolites (designated I, II, III, and IV) were separated after ethyl acetate extraction from an incubation mixture containing microsomes fortified with an NADPH generating system. Group I and IV contain at least two components. When NADH was substituted for the NADPH system, the rates of formation of groups I, II, and III were reduced by 50% and group IV by 84%. When both NADH and NADPH were used the rates of formation of all metabolites were doubled, as compared to NADPH alone. The rate of formation of all metabolites is faster by males than females. Group IV accounted for 72% of all metabolites formed by microsomes from males, but only 30% of metabolites by females. In female rats the rates of formation of II and IV were increased by 50% and 250% respectively by pretreatment with dieldrin, 40 mg/kg, 48 hr before sacrifice. Groups I and III were not affected. Diet also significantly affects dieldrin metabolism. Male rats maintained on a standard diet metabolized ^{14}C dieldrin about 50% faster than those on a semi-purified diet. These studies indicate that the rate and pathways of dieldrin metabolism can be markedly influenced by nutritional, hormonal and environmental factors. (Author abstract by permission)

75-1090. Brown, T. R.; Greene, F. E. (Dep. Pharmacol. and Med., M. S. Hershey Med. Cent., Pennsylvania State Univ., Hershey, PA 17033). **Specificity of androgen stimulation of hepatic microsomal drug metabolizing activity.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 725; 1975.*

It has been assumed that the liver lacks specificity in response to androgens. In previous studies, it was observed that administration of testosterone (T) to female and castrated male Balb/cJ mice stimulated hepatic microsomal ethylmorphine *N*-demethylase activity (Etm) and cytochrome P-450 content (P-450) by 25-50%. To test the specificity of this effect, two anti-androgens which act as competitive inhibitors of the androgen receptor complex formation, cyproterone acetate (CPA) and flutamide (FA, Sch 13521, *α-α-α*-trifluoro-2-methyl-4'-nitro-*m*-propionotoluidide) were employed. CPA, given alone or concomitantly with T to

castrated male Balb/cJ mice, increased Etm and P-450 by as much as 100%. In contrast, FA alone did not significantly alter either parameter, but blocked the stimulatory effect of T. This effect was not species specific, since FA also prevented androgen stimulation of Etm in castrated male rats. These apparently divergent results are explained by the potent progestational activity of CPA, whereas the non-steroidal compound, FA, has no hormonal activity. However, FA as well as CPA and T increased microsomal protein content. It is concluded that CPA is a potent stimulator of Etm and P-450; that FA, but not CPA, blocks androgen stimulation of Etm and P-450; and that androgenic action in the liver may be expressed by non-specific effects as well as by a specific hormonal activity involving an androgen receptor mechanism. (Author abstract by permission)

75-1091. Stitcher, D. L; Harris, L. W.; Garry, V. F. (Biomed. Lab., Edgewood Arsenal, APG, MD 21010). **The involvement of adenosine 3′,5′-monophosphate in poisoning of animals by anticholinesterase.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 737; 1975.*

The present investigation was undertaken to provide additional insight into the biochemistry of anticholinesterase poisoning as related to adenosine 3′,5′-monophosphate (cAMP). Cyclic AMP was measured in the plasma of rabbits before and 15 minutes after poisoning with 10.8 μg/kg (i.v.) pinacolyl methylphosphonofluoridate (soman). The method for cAMP determination uses cAMP phosphodiesterase (PDE) and a cAMP-dependent protein kinase covalently attached to Sepharose 2B and requires no purification. Ion exchange chromatography (Dowex 50W-X4) was used to purify the plasma extract from interfering nucleotides both to insure that cAMP was converted completely to 5′-AMP by PDE and to separate guanosine 3′,5′-monophosphate (cGMP) from cAMP. Plasma cAMP levels were not significantly altered by chromatography. Poisoning of rabbits with soman resulted in a four-fold increase in plasma cAMP. Pretreatment of mice with theophylline (50 mg/kg, i.p.) and/or N^6 0^2 -dibutyryl adenosine 3′,5′-monophosphate (65 mg/kg, i.p.) prior to or shortly after poisoning makes the animals more sensitive to soman. cAMP participates in the poisoning and may well potentiate it. (Author abstract by permission)

75-1092. Stevens, J. T. (Environ. Prot. Agency, Natl. Environ. Res. Cent., Research Triangle Park, NC 27711). **The re-oxidation of cytochrome P-450 by parathion. A reappraisal.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 756; 1975.*

It has been previously shown that parathion produced a unique binding spectrum exhibiting a maximum at 450 nm upon addition to a microsomal suspension containing biochemically or chemically reduced cytochrome P-450 (*Life Sci.* 14:2215, 1974). In addition the Soret at 421 nm was not associated with conversions of cytochrome P-450 to cytochrome P-420. Although these findings were interpreted as being indicative of binding of parathion to the reduced form of the cytochrome, further investigation revealed that the spectral shift previously described with a peak at 421 nm and trough at 450 nm is associated with the reoxidation of cytochrome P-450 by parathion. Data will be presented to document this event using the techniques of off-balance and difference spectral analysis. (Author abstract by permission)

75-1093. Farber, T. M.; Marks, R. M.; Cerra, P. E. (Div. Toxicol., Food and Drug Adm., Washington, DC 20204). **Dichlorvos and microsomal enzyme activity.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 785; 1975.*

In light of the observation that dichlorvos, when given orally to dogs, caused a proliferation of the smooth endoplasmic reticulum of the liver (B. Y. Cockrell et al., *Am. J. Vet. Res.* 33: 687; 1972), the effect of dichlorvos on microsomal drug metabolism was studied. Administration of 500 ppm of dichlorvos in the drinking water of rats for 7 days failed to alter hexobarbital sleeping times and the aminopyrine demethylase activity of 900 *g* supernatant incubates obtained from treated rats as compared to controls. Similarly, i.p. administration of dichlorvos, 1 mg/kg b.i.d. for 3 days, caused no alteration in hexobarbital sleeping time compared to control rats and in vitro studies showed no significant alterations in aminopyrine demethylase, *p*-nitrobenzoic acid reductase, and pentobarbital hydroxylase activities or in microsomal protein and cytochrome P-450 contents. Oral administration of 44 mg/kg of dichlorvos as an anthelmintic formulation (TASK) caused no significant changes in surital sleeping times in the dog and did not materially alter aminopyrine demethylase, aniline hydroxylase or pentobarbital hydroxylase activities of 9000 g supernatant preparations obtained from dogs 24, 48 and 72 hours after dichlorvos administration. No significant changes were seen in microsomal protein, cytochrome P-450 or NADPH cytchrome C reductase content, 48 or 72 hours after dichlorvos administration. (Author abstract by permission)

75-1094. Bulger, W. H.; Kupfer, D. (Worcester Found. Exp. Biol., Shrewsbury, MA 01545). **Induction of ovnithine decarboxylase (OD) by chlorinated hydrocarbon insecticides and estradiol (E_2) in rat uteri.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 810; 1975.*

The induction of OD by estrogens in the rat was previously demonstrated by Cohen et al., 1970 and Kaye et al., 1971. Since certain chlorinated hydrocarbons exhibited estrogenic activity (Welch et al., 1969), the effect of chlorinated hydrocarbon insecticides on the OD activity in uteri of immature rats was investigated. Pretreatment with various doses of *o,p′*-DDT or E_2 caused a marked increase in the specific activity of OD

in the 20,000 g supernatant fraction of uterine homogenates but not in liver homogenates. Doses as low as 1 mg of *o,p'*-DDT or 0.25 μg of E_2 stimulated OD activity. Injection of 10 mg of *o,p'*-DDT caused a 13 fold elevation of OD activity. The peaks of activity after *o,p'*-DDT and E_2 injections occurred at 6 hr and 4 hr, respectively. Treatment with inhibitors of protein synthesis effectively blocked the increase in OD activity caused by *o,p'*-DDT, indicating that the elevation in OD was due to enzyme induction. The comparative examination of various chlorinated hydrocarbon insecticides demonstrated that *o,p'*-DDT was the most potent inducer of OD activity in the uterus. The order of decreasing potency was *o,p'*-DDT > *o,p'*-DDD > *p,p'*-DDT > *p,p'*-DDD (TDE). These results are discussed with respect to the estrogenicity of chlorinated hydrocarbon insecticides. (Author abstract by permission)

75-1095. Burns, K. A.; Sabo, D. (Dep. Nutr., Harvard Sch. Public Health, Boston, MA 02543). **Environmental contamination and the induction of microsomal mixed function oxidases in an estuarine fish, *Fundulus heteroclitus*.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 810; 1975.*

An hepatic microsomal mixed function oxidase (MFO) system is described in the estuarine fish, *Fundulus heteroclitus*. In vitro aldrin epoxidation rates were measured and compared favorably to those seen in freshwater fish. The oxidases are microsomal, require NADPH, and contain cytochrome P-450. The system is completely inhibited by carbon monoxide. The introduction of 100 ppb sodium phenylbutazone to holding tanks increased aldrin epoxidation rates 3-fold, cytochrome P-450 levels 10-fold, and liver microsomal protein 2-fold when compared to control fish. Rates of aldrin epoxidation in fish living in salt marshes contaminated with petroleum derived and chlorinated hydrocarbons were generally twice those seen in populations living in a clean environment. The calculated Michaelis constants (Km) and maximum velocities (*V*max) were 4.5×10^{-6} M and 0.26 nmoles dieldrin formed/mg microsomal protein-min in fish living in a clean area and 6.5×10^{-6} M and 0.93 nm/mg min in fish from an oil polluted environment. These results are consistent with the hypothesis that environmental contamination induces high levels of MFO in fish. (Author abstract by permission)

75-1096. Abou-Donia, M. B.; Preissig, S. H. (Dep. Physiol. Pharmacol. Pathol., Duke Univ. Med. Cent., Durham, NC 27710). **Studies on delayed neurotoxicity produced by leptophos.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 810; 1975.*

Studies on delayed neurotoxicity produced in hens given a single oral dose of leptophos, *O*-(4-bromo-2,5-dichlorophenyl) *O*-methyl phenylphosphonothioate, have been conducted. Three levels of the insecticide were administered: 200, 400 and 800 mg/kg. All treated birds developed signs of delayed neurotoxicity. This condition was characterized by ataxia developing 8-14 days after the administration of leptophos, followed by paralysis and eventually death. Acetylcholinesterase in red blood cells showed an initial inhibition, then a substantial recovery. On the other hand plasma cholinesterase, after initial inhibition and recovery, was severely inhibited as the signs of neurotoxicity progressed. Histological examination revealed marked axon and myelin degeneration of the sciatic nerve and spinal cord. Less severe changes were seen in the medulla and cerebellar peduncle of the brain. Early non-specific degeneration of muscle fibers was replaced by neurogenic atrophy at later stages of intoxication. Leptophos produced neurotoxicity in hens similar to that reported for other neurotoxc organophosphorus compounds. (Author abstract by permission)

75-1097. Miller, D. S.; Peakall, D. B.; Kinter, W. B. (Mt. Desert Isl. Biol. Lab., Salsbury Cove, ME 04672). **Biochemical basis for DDE-induced eggshell thinning in ducks.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(3): 811; 1975.*

DDE [2,2-*bis*-(*p*-chlorophenyl)-1,1-dichloroethylene]-fed white Pekin ducks, *Anas platyrhynchos*, laying thin-shelled eggs (20% thinner than controls) did not exhibit reduced plasma calcium levels when compared to laying controls. This finding indicates that DDE affects shell gland (SG) function rather than calcium supply to the gland. In vitro experiments showed that DDE partially inhibited the following enzymes in SG mucosal homogenate: Ca-ATPase, Na,K-ATPase, Mg-ATPase, HCO_3-ATPase, as well as ^{45}Ca binding to calcium binding protein. Carbonic anhydrase was not inhibited and only Ca-ATPase and Na,K-ATPase were sensitive to in vitro concentrations as low as those found in SG mucosa (< 3 ppm DDE) of ducks fed 40 ppm DDE and laying 20% thinner shells. Moreover, in DDE-fed ducks, only the Ca-ATPase activity was reduced significantly (35%, $P < 0.02$). In contrast, chicken SG Ca-ATPase was less sensitive to DDE in vitro, and was unaffected by feeding 40 ppm DDE. Since the chicken is a species that does not exhibit DDE-induced eggshell thinning, DDE may act in sensitive birds, e.g. ducks, by inhibiting the action of a cellular Ca-pump similar to that found in sarcoplasmic reticulum or red blood cells. (Author abstract by permission)

75-1098. Wang, C. Y.; Chiu, C. W.; Bryan, G. T. (Div. Clin. Oncology, Univ. Wisconsin Med. Sch., Madison, WI 53706). **Nitroreduction of carcinogenic 5-nitrothiophenes by rat tissues.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(4): 828; 1975.*

Nitroreduction of anthelmintic and carcinogenic 5-nitrothiophenes, 4-(2,3-dihydroxypropylamino)-2-(5-nitro-2-thienyl)-quinazoline and 4-(2-hydroxyethyl-

amino)-2-(5-nitro-2-thienyl)-quinazoline, by rat tissues was studied. Corresponding amines of these 5-nitrothiophenes were synthesized by catalytic reduction. Concentrations of 5-nitro- and 5-amino-thiophenes were measured photometrically. Nitroreduction of 5-nitrothiophenes was catalyzed by rat liver cytosol and microsomes. Cytosol enzyme activity was hypoxanthine dependent and inhibited by allopurinol and air. Microsomal enzyme activity was NADPH dependent and inhibited by air. The reaction was also catalyzed by a purified milk xanthine oxidase. Nitroreductase activities of small intestine and liver were higher than those of kidney and stomach; the reduced products were qualitatively similar and bound to protein. Depending on the source of enzyme, only 25% to 50% of the reduced 5-nitrothiophene was converted to the corresponding amine. The rest of the reduced product may exist as reduced intermediates or bind to protein. The results suggest that: (1) 5-nitrothiophenes may be reduced by xanthine oxidase or NADPH-cyt. c reductase; (2) nitroreduction may be involved in 5-nitrothiophene activation; and (3) liver and small intestine may be the main organs for the metabolism of 5-nitrothiophenes. (Author abstract by permission)

75-1099. Stahl, P.; Mandell, B.; Rodman, J. S.; Lang, S. (Washington Univ. Med. Sch., St. Louis, MO). **Selective effects of DFP and paraoxon on serum β-glucuronidase.** *Fed. Proc. Fed. Am. Soc. Exp. Biol. 34(4): 858; 1975.*

Paraoxon (0.1 mg/kg, ip) and diisopropylfluorophosphate (1 mg/kg, ip) (DFP) produce a massive increase (80-100 fold) in rat serum β-glucuronidase without significantly altering the serum levels of 5 other lysosomal enzymes. The response is not blocked by atropine nor mimicked by carbachol or neostigmine. Evisceration prior to administration of the drug abolishes the hyper-β-glucuronidemic effect. Splenectomy alone does not alter the response. Various rat β-glucuronidases have been isolated by specific antibody-Sepharose chromatography from rat liver lysosomes (LLG), microsomes (LPG), and sera of rats treated with diisopropylfluorophosphate (DFPG). Isoelectric focusing in 6 *M* urea indicates all these enzymes are heterogeneous, with PI's of 5.5-6.0 (LLG), 6.7 (LPG), and 5.4 (DFPG), respectively. Intravenous injection of LLG and LPG into the anesthetized rat results in rapid clearance of enzymatic activity ($t_{1/2} \sim 10$ minutes). Prior evisceration prolongs the serum lifetime of the enzyme suggesting the liver plays a major role in their clearance. Moreover, pretreatment with asialofetuin does not interfere with enzyme clearance. Contrariwise, purified serum β-glucuronidase from DFP treated rats has a much longer serum halftime ($t_{1/2} \sim 50$ minutes). The basis for the DFP effect and the mechanism of clearance are under investigation. (Author abstract by permission)

75-1100. Bollag, J. M. (Lab. Soil Microbiol., Dep. Agron., Pennsylvania State Univ., University Park, PA). **Microbial transformation of pesticides.** *Adv. Appl. Microbiol. 18:75-130; 1974.* (201 references)

The probable transformation capabilities of pesticides by microorganisms are assessed and the specific enzymatic reactions which are part of the metabolism for the major known groups of pesticides are characterized. Mechanisms of pesticide transformation are discussed in terms of pesticides as a nutrient source, cometabolism, conjugate formation, and the microbial formation of pesticides. Enzymatic reactions in pesticide metabolism include oxidative reactions, reductions, hydrolysis, dehalogenation mechanisms, and synthetic reactions. Finally, a discussion of the relationship between chemical structure and microbial transformation centers on the microbial transformation of pesticidal groups, the effect of various substitutions on biodegradability, and molecular recalcitrance and pesticide transformation. Although one must be aware of the difficulty in extrapolating from experiments and results obtained in vitro to the complex environment of a natural habitat, basic laboratory studies are a prerequisite for establishing the possibilities of microbial pesticide transformations in a natural environment.

75-1101. Ando, M.; Nakamura, T.; Nakagawa, M. (Agric. Chem. Res Lab., Sankyo Co., Ltd., Tokyo, Japan). **Metabolism of hymexaxol, 3-hydroxy-5-methylisoxazole, in the rats.** *Agric. Biol. Chem. 38(12):2451-2456; 1974.* (8 references)

Excretion, distribution and metabolism of the fungicide, hymexazol, 3-hydroxy-5-methylisoxazole, labeled with ^{14}C at the 3-position were examined after single oral administration to male Wistar rats. Hymexazol was rapidly absorbed and distributed in the tissues; higher amounts were found in the liver and kidney and lower amounts in brain, muscle, and body fat. During 96 hr, 97% of the total radioactivity was excreted in the urine and 0.89% in the feces, and 0.86% was found in the expired air. Two metabolites were detected in the urine. Their chemical structures were determined, respectively, as 3-(beta-D-glucopyranuronosyloxy)-5-methylisoxazole and 5-methyl-3-isoxazolyl sulfate. Metabolic pathways of hymexazol were proposed.

75-1102. Bhaskaram, C.; Sadasivan, G. (Indian Council Med. Res., Hyderabad, India). **Effects of feeding irradiated wheat to malnourished children.** *Am. J. Clin. Nutr. 28(2): 130-135; 1975.* (7 references)

A group of 10 children (aged 2-5 yr), hospitalized with kwashiorkor, all suffered severe growth retardation, edema of the lower extremities, mental apathy, and hypoalbuminemia. They were rehabilitated with diets providing 4 g protein and 200 kcal/kg. The diet contained 20 g wheat/kg. Five children received freshly irradiated wheat; the other 5, unirradiated wheat. Diets continued for 6 weeks. An additional 5 children received

wheat which had been stored for a period of 12 weeks after irradiation. No differences were noted between the three groups of children either in the clinical or biochemical response. However, in 4 of the 5 who received fresly irradiated wheat, varying numbers of polyploid cells appeared 4 weeks after the diets were started, the mean incidence at this time being 0.8%. At 6 weeks this incidence increased to 1.8%. There were also other abnormal cells, characterized by splitting of their centromeres with widely separated chromatids. Considering these cells also, the mean incidence of total abnormal cells at 4 and 6 weeks was 1.2 and 3.8%, respectively. Follow-up investigations in 2 of these children showed that the polyploid and abnormal cells had completely disappeared by the 24th week. No abnormal cell was found in any child receiving unirradiated wheat. In children eating stored irradiated wheat, the incidence of definite polyploid cells was 0% at 4 weeks and only 0.6% at 6 weeks. Even considering other types of abnormal cells, these figures rose only to 0.6% and 0.8%, respectively. It is concluded that the appearance of the polyploid cells was due to the feeding of irradiated wheat. Storage of wheat after irradiation greatly reduced the cytotoxicity induced by irradiation. It is urged that irradiated wheat be stored for periods beyond 12 weeks before it can be considered safe for human consumption.

75-1103. Davison, K. L.; Cox, J. H.; Graham, C. K. (Metab. Radiat. Res. Lab., Fargo, ND 58102). **The effect of mirex on reproduction of Japanese quail and on characteristics of eggs from Japanese quail and chickens.** *Arch. Environ. Contam. Toxicol. 3(1): 84-95; 1975.* (15 references)

Laying white leghorn chickens were fed mirex at 0, 5, 10, 20, 40, 80, and 160 ppm for 12 weeks, and laying Japanese quail were fed mirex at 0, 5, 40, and 80 ppm for 12 weeks. The data suggests that dietary mirex at these levels did not affect egg production, egg weight, shell thickness, shell calcium, the proportion of broken eggs, or the proportion of soft-shelled eggs of either chickens or quail. Statistical significance ($P < 0.05$) associated with dietary mirex was detected in the analysis of eggshell weight for chickens; however, because a dose-response relationship of shell weight vs. level of mirex fed was not evident, this observation was attributed to chance. The data suggests that dietary mirex did not affect eggshell weight, fertility, or hatchability of quail. Mirex accumulation in eggs and carcasses of both species was proportional to dose and was slightly higher in quail than in chickens. (Author abstract by permission)

75-1104. Ludke, J. L.; Hill, E. F.; Dieter, M. P. (Bur. Sport Fish. Wildl., Patuxent Wildl. Res. Cent., Laurel, MD 20810). **Cholinesterase (ChE) response and related mortality among birds fed ChE inhibitors.** *Arch. Environ. Contam. Toxicol. 3(1): 1-21; 1975.* (39 references)

Patterns of mortality and inhibition of brain and plasma ChE in birds treated with ChE inhibitors were studied in an attempt to determine the validity of using ChE activity as a monitoring and diagnostic technique. Analysis of brain ChE activity proved to be reliable for diagnosing and monitoring effects of selected ChE inhibitors in birds. Brain ChE inhibition exceeding 20% indicated exposure, and inhibition greater than 50% was sufficient for diagnosing cause of death. Individuals that died from dietary exposure to parathion or carbofuran had brain ChE activities below 55% of normal, although individuals could survive with brain ChE activity lower than 50%. Problems associated with collection, storage, and analysis of tissues for ChE activity are discussed. (Author abstract by permission)

75-1105. Grunow, W.; Boehme, C. (Bundesgesundheitsamt, Max-von-Pettenkofer Inst., Berlin, Germany). **Ueber den Stoffwechsel von 2,4,5-T and 2,4-D bei Ratten und Maeusen. [Metabolism of 2,4,5-T and 2,4-D in rats and mice.]** *Arch. Toxicol. 32(3): 217-225; 1974.* (20 references) (German)

Following oral administration of the herbicide 2,4,5-T to rats and mice, the unchanged acid was found to be the main excretion product in the urine. The conjugates with glycine and taurine, as well as 2,4-5-trichlorophenol, were identified as metabolites. In the urine of rats the conjugates of 2,4,5-T were excreted in nearly equal amounts, whereas in mice the quantity of the taurine conjugate was increased. In rats, biotransformation of 2,4-D to the corresponding glycine and taurine conjugate was also detected. However, this herbicide showed a remarkably reduced tendency to be conjugated, as compared with 2,4,5-T. (Author abstract by permission)

75-1106. Bohme, C.; Grunow, W. (Bundesgesundheitsamt, Max-von-Pettenkofer Inst., Abt. Toxikol., Berlin, Germany). **Ueber den Stoffwechsel von 4-(2,4,5-trichlorphenoxy)-buttersaeure bei Ratten. [Metabolism of 4-(2,4,5-trichlorophenoxy)-butyric acid in rats.]** *Arch. Toxicol. 32(3): 227-231; 1974.* (7 references)

2,4,5-Trichlorophenol was found as the principal metabolite of the herbicide 4-(2,4,5-T)-B, following oral administration to rats. It was present in the urine not only as free phenol but also in conjugated form. 2,4,5-T as final product of β-oxidation and traces of the unchanged herbicide were also excreted. In feces, free 2,4,5-trichlorophenol and unchanged 4-(2,4,5-T)-B were detected. (Author abstract by permission)

75-1107. Ahlborg, U. G.; Lindgren, J. E.; Mercier, M. (Dep. Toxicol., Swedish Med. Res. Council, Karolinska

Institute, Stockholm, Sweden). **Metabolism of pentachlorophenol.** *Arch. Toxicol. 32(4): 271-281; 1974.* (15 references)

Excretion of pentachlorophenol-^{14}C in the urine of rats and mice after oral and intraperitoneal administration (10 to 25 mg/kg) was studied. 41 to 43% of the excretion activity was found to be present as unchanged pentachlorophenol. By means of gas chromatography-mass spectrometry, one metabolite was identified as tetrachlorohydroquinone, representing 5 and 24% of the excreted activity in rats and mice, respectively. Conjugation with glucuronic acid could not be demonstrated by enzymatic hydrolysis since tetrachlorohydroquinone was found to be a potent inhibitor of β-glucuronidase, the I_{50} being 1.6 to $2.0 \times 10^{-6} M$. Boiling the urine with hydrochloric acid was shown to convert all of the excreted activity to pentachlorophenol and tetrachlorohydroquinone, the latter representing 43 and 46% in rats and mice, respectively. Tetrachlorohydroquinone was found in the urine of workers occupationally exposed to pentachlorophenol. (Author abstract by permission)

75-1108. Kimmerle, G.; Klimmer, O. R. (Inst. Toxicol., Bayer AG, Wuppertal, Germany). **Acute and subchronic toxicity of sulfotep.** *Arch. Toxicol. 33(1): 1-16; 1974.* (7 references)

Sulfotep (TEDP) was evaluated for its acute and subchronic toxicity. The oral LD50 values in laboratory animals range from 3 to 30 mg/kg body weight. The most susceptible animals tested were cats and dogs. TEDP was readily absorbed by the intact skin of rats. Following oral administration of effective doses of TEDP to male rats, the cholinesterase activity in blood showed the greatest depression, which determines the poisoning symptoms, within 24 hrs after application. The antidotes atropine, pralidoxime, and obidoxime effectively counteracted TEDP in rats and hens. The compound did not cause any neurotoxic effects on the skin and mucous membranes of rabbits. Male and female rats were maintained for 3 months on a diet containing TEDP at concentrations of 0, 5, 10, 20, and 50 ppm, respectively. Dietary levels of 50 ppm and below did not affect the appearance, behavior, weight gain, hematological values, composition of the urine, organ weights, and morphology of organs. There was a dose-related inhibition of the blood cholinesterase activity at 20 and 50 ppm. The following inhalation LC50 values were determined for rats and mice following inhalation of TEDP aerosols: 1 hr exposure: male rats 330, female rats 160, male mice 155; 4 hr exposure: male rats 59, female rats 38, male mice 40 mg/m^3 air. The exposure of rats to concentrations of 0.89, 1.94, and 2.83 mg/m^3, respectively, for 12 weeks, 6 hrs daily, five times weekly, resulted only in effects on the animals inhaling aerosols of the highest concentration. This group showed some edema of the lungs and a significant depression of the plasma cholinesterase activity. The results are in agreement with the established maximum allowable concentration of 0.2 mg/m^3. (Author abstract by permission)

75-1109. Ganz, J. W.; Poser, W.; Erdmann, W. D. (Inst. Pharmakol. Toxicol., Univ. Goettingen, Goettingen, Germany). **Untersuchungen zur Lebertoxizitaet von Nitrostigmin (Parathion, E 605) an der perfundierten Rattenleber. [Studies on liver toxicity of nitrostigmine (parathion, E 605) in the perfused rat liver.]** *Arch. Toxicol. 33(1): 31-40; 1974.* (28 references) (German)

Livers of male well fed Wistar rats were perfused with an albumin- and hemoglobin-free medium in a recirculating system. After an equilibration period either 12.5 mg/kg body weight nitrostigmine or 0.5 ml/kg dimethylsulfoxide (controls) were added to the medium. The following parameters of liver function were not altered by nitrostigmine: oxygen consumption, lactate/pyruvate and 3-hydroxybutyrate/acetoacetate ratios in the medium, output of potassium and aspartate aminotransferase (GOT), bile flow, glucose production, production of lactate plus pyruvate, and production of ketone bodies. A liver homogenate was prepared after the end of the perfusion. The activity of acetylcholine cleaving enzymes in the homogenate was strongly depressed in the nitrostigmine treated livers. These results show that neither nitrostigmine nor a metabolite nor the inhibition of acetylcholinesterases damaged liver cell membranes or influenced the energetic situation. Thus liver damage after nitrostigmine intoxication in vivo is due to the inhibition of respiration. This effect is caused by an "endogenous acetylcholine intoxication". (Author abstract by permission)

75-1110. Tjaelve, H. (Dep. Toxicol., Univ. Uppsala, Uppsala, Sweden). **Fetal uptake and embryogenetic effects of aminotriazole in mice.** *Arch. Toxicol. 33(1): 41-48; 1975.* (18 references)

The absorption and distribution of aminotriazole (amitrole, 3-amino-1,2,4-triazole) in the fetal tissues of mice were studied by whole body autoradiography upon the administration of ^{14}C-labeled aminotriazole. Extraction procedures combined with thin-layer chromatography were used to define the chemical nature of the radioactivity in the fetuses; the effect of aminotriazole on the embryogenesis was also observed. Aminotriazole was passed to the fetuses and the distribution pattern was found to be similar to that of the mothers: the greatest accumulation occurred in tissues with a rapid cell turnover—such as the bone marrow, gastrointestinal mucosa, thymus, and spleen. Most of the aminotriazole was present in the fetus in a non-metabolized form. The administration of 1000, 2500, or 5000 ppm of aminotriazole to the dam's drinking water resulted in a marked decrease in the weight gain of the dams and a pronounced under-development of the fetuses. Malformations were not observed. It is suggested that aminotriazole participates in some process of rapidly dividing cells which accounts for the reported observations. (Author abstract by permission)

75-1111. Haag, D.; Goerttler, K.; Preiss, D. (Pathol. Inst., Univ. Heidelberg, Heidelberg, Germany). **The**

influence of non-cytotoxic concentrations of the herbicide 2,4-dichlorophenoxyacetic acid on the DNA-synthesis in cultured vertebrate cells. *Arch. Toxicol. 33(2): 91-102; 1975.* (26 references)

The influence of the herbicide 2,4-dichlorophenoxyacetic acid on the growth of cultured chicken muscle cells was studied by observing morphological changes and by cytophotometric measurement of the DNA content of individual cells. DNA-synthesis curves were derived from the distribution of DNA values. No marked effects were observed at a concentration of 60 μg per liter. In contrast, doses of 600 μg per liter caused a loss of cell differentiation consisting of a partial lack of polar orientation, diminished formation of fibers, and an increase of the N/C ratio. The nuclear matrix of desoxyribonucleoprotein (DNP) changed to a more heteropycnotic structure. Isolated cell necroses were found after 44 hr of exposure. When compared to the controls, the relative DNA synthesis time was found to be prolonged 1.5-fold. The number of cells in the G_2 phase decreased during 44 hr of exposure. It is concluded from these results that the dose-dependent growth inhibition of 2,4-D on vertebrate cells in culture takes effect during DNA synthesis. The morphological changes of the nuclear structure suggest that 2,4-D directly affects the template activity of the DNP matrix. (Author abstract by permission)

75-1112. Dedek, W.; Scheufler, H.; Fischer, G. W. (Forschungsstelle Chem. Toxicol., Akad. Sci., Leipzig, DDR). **Zur Mutagenitaet von Desmethyl-Trichlorphon im Dominanten-Letal-Test an der Hausmaus. [Mutagenicity of desmethyl trichlorfon in the dominant lethal test on mice.]** *Arch. Toxicol. 33(2): 163-168; 1975.* (18 references) (German)

After i.p. administration to AB mice of 405 mg/kg desmethyltrichlorfon (sodium salt) in a single dose and 54 mg/kg daily for 3 weeks, the mutagenic effect in the dominant lethal test was at least the same as that of trichlorfon. These findings indicate that the genotoxic effect of trichlorfon is not likely to be due to its alkylating properties. (Author abstract by permission)

75-1113. Reichel, W. L.; Locke, L. N.; Prouty, R. M. (U.S. Fish and Wildlife Serv., Patuxent Wildlife Res. Cent., Laurel, MD 20811). **Peregrine falcon suspected of pesticide poisoning.** *Avian Dis. 18(3): 487-489; 1974.* (11 references)

In March 1973 an adult female peregrine falcon was found dead in Manteo, North Carolina. The bird had no deposits of subcutaneous, mesenteric, coronary, or abdominal fat, there were no injuries present, and the myocardium, heart valves, and liver appeared normal. The posterior portions of both lungs appeared consolidated and three or four tightly coiled nematodes were found adhering to the body wall in the right thoracic and right abdominal air sacs. The intestines were dark brownish red, and the lumen was filled with granular debris, sloughed epithelium, and hemorrhage; a pure culture of *Edwardsiella tarda* was isolated from the intestinal contents. Dieldrin (5.4 ppm) was found in the brain. It is concluded that dieldrin poisoning was the proximate cause of death in this falcon, with disease contributory.

75-1114. Lalka, D.; Bardos, T. J. (Dep. Biochem. Pharmacol. and Med. Chem., State Univ. New York, Buffalo, NY 14214). **Cyclophosphamide, 2,2-dimethylaziridines and other alkylating agents as inhibitors of serum cholinesterase.** *Biochem. Pharmacol. 24(4): 455-462; 1975.* (23 references)

The effects of cyclophosphamide (CTX) and of alkylating agents containing aziridine or 2,2-dimethylaziridine moieties on the procaine esterase activity of horse serum cholinesterase were investigated. The results indicated that CTX is a competitive, reversible inhibitor of the enzyme, while all the other agents studied caused irreversible inhibition. However, there was no over-all correlation between the cholinesterase inhibitory activities of these agents and their alkylating reactivities toward the model nucleophile 4-(*p*-nitrobenzyl)pyridine (NBP). The kinetics of inhibition were consistent with the formation of a reversible enzyme-alkylating agent complex prior to the irreversible inactivation of the enzyme. In the case of the ring-C-unsubstituted aziridines (TEM, TEPA and AB-100), the inactivation process could be described by the Main equation from which a dissociation constant (Kd) and a reaction rate constant (k2) were calculated. The 2,2-dimethylaziridines (AB-132, AB-163 and TEPA-132) readily hydrolyzed, with rapid loss of alkylating activity (vs NBP). Simultaneously, the cholinesterase inhibitory activities of AB-132 and AB-163 significantly increased, reached a maximum and then gradually decreased on further hydrolysis; in contrast, TEPA-132 showed progressive loss of inhibitory activity. These results indicate that both AB-132 and AB-163 (but not TEPA-132) hydrolyze with the formation of an unstable intermediate(s) having little or no alkylating activity but acting as a potent, irreversible cholinesterase inhibitor(s). (Author abstract by permission)

75-1115. Nakazawa, N.; Makino, F.; Okada, S. (Dep. Radiat. Biophys., Fac. Med., Tokyo Univ., Hongo, Bunkyo-ku, Tokyo, Japan). **Acute effects of mercuric compounds on cultured mammalian cells.** *Biochem. Pharmacol. 24(4): 489-493; 1975.* (22 references)

The observed acute effects of methyl mercuric chloride on cultured mammalian cells comprised retardation of cell multiplication, cell killing, depression of [^{3}H]thymidine and [^{3}H]uridine uptake, and induction of single-strand scissions of DNA. Among the cellular responses studied, [^{3}H]thymidine and [^{3}H]uridine incorporation were the most sensitive indicators of

cellular mercuric poisoning. Toxicities of three mercuric compounds—methyl mercuric chloride, phenyl mercuric acetate and mercuric chloride—were compared by using two indicators, [^{3}H]thymidine incorporation and cell multiplication. Methyl mercuric chloride and phenyl mercuric acetate were equally toxic, while mercuric chloride was the least toxic. Addition of glutathione to cells pretreated with methyl mercuric chloride allowed the cells to recover from the toxic effects of methyl mercuric chloride at a faster rate than those left without glutathione. (Author abstract by permission)

75-1116. Hart, G. J.; O'Brien, R. D. (Sect. Neurobiol. Behavior, Cornell Univ., Ithaca, NY). **Trialkyl phosphates and phosphorothiolates—lack of hydrophobic interaction with acetylcholinesterase.** *Biochem. Pharmacol. 24(4): 540-542; 1975.* (8 references)

Small quantities of *O,O*-diethyl-*O*-(ω-isopropyl)-alkyl phosphates (I) and *O,O*-diethyl *S*-(ω-isopropyl)-alkyl phosphorothioates (II) were shaken with aqueous NaOH and neutralized with dilute HCl. Organophosphorus compounds were extracted from the solutions using $CHCl_3$. The infrared spectra of all phosphates and phosphorothiolates were similar before and after NaOH treatment, indicating that the compounds were resistant to hydrolysis under the conditions used. None of the NaOH-treated compounds showed any ability to phosphorylate bovine erythrocyte acetylcholinesterase. The NaOH-treated compounds appeared to act as very weak reversible inhibitors, the dissociation constants being in the region of 10^{-2} *M* and showing no significant general correlation with alkyl chain length. Hydrophobic interactions do not appear to be involved in their inhibition of acetylcholinesterase.

75-1117. Reiner, E.; Krauthacker, B.; Simeon, V.; Skrinjaric-Spoljar, M. (Inst. Med. Res. Yugoslav Acad. Sci. & Arts, Zagreb, Croatia, Yugoslavia). **Mechanism of inhibition in vitro of mammalian acetylcholinesterase and cholinesterase in solutions of *O,O*-dimethyl 2,2,2-trichloro-1-hydroxyethyl phosphonate (trichlorphon).** *Biochem. Pharmacol. 24(6): 717-722; 1975.* (23 references)

The rate of decomposition of trichlorfon into DDVP (dichlorvos) was measured polarographically at pH 7.4. The first order rate constants of decomposition at 25° are 7.27×10^{-4} and 6.05×10^{-4} min^{-1} for trichlorfon concentrations of 0.150 and 15.0 mM respectively; at 37° the corresponding rate constants are 53.1×10^{-4} and 37.1×10^{-4} min^{-1}. The rate of decomposition of trichlorfon was also calculated from the kinetics of inhibition of acetylcholinesterase (EC 3.1.1.7) and cholinesterase (EC 3.1.1.8) in trichlorfon solutions at 25° and 37° (pH 7.4). The following enzyme sources were used: bovine erythrocytes and rat brain acetylcholinesterase, and human, horse and rat plasma cholinesterase. The rate of decomposition of trichlorfon was calculated by assuming that only DDVP formed from trichlorfon is the enzyme inhibitor, while trichlorfon itself does not act as an inhibitor. The calculated rate constants for the decomposition of trichlorfon are lower or just within the range of the rate constants obtained by the polarographic method. This agreement was taken as kinetic evidence that trichlorfon is not an inhibitor of mammalian cholinesterases. The effect of pH on enzyme inhibition supports this conclusion. The rate of inhibition of bovine erythrocyte acetylcholinesterase by DDVP is the same at pH 7.4 and pH 6.0 (37°). However, the rate of enzyme inhibition in trichlorfon solutions is 30 times faster at pH 7.4 than at pH 6.0 and this agrees with the greater stability of trichlorfon at the lower pH value. The rate of spontaneous reactivation of the enzyme was measured (37°, pH 7.4) after inhibition in trichlorfon solutions of acetylcholinesterase (human and bovine erythrocytes) and cholinesterase (human plasma). For all three enzyme preparations, the rate of spontaneous reactivation was the same as that obtained after inhibition by DDVP. All results point to the conclusion that trichlorfon in vitro is not an inhibitor of mammalian cholinesterases. (Author abstract by permission)

75-1118. Johnson, M. K. (Med. Res. Council, Toxicol. Unit, Carshalton, Surrey, Endland). **Structure-activity relationships for substrates and inhibitors of hen brain neurotoxic esterase.** *Biochem. Pharmacol. 24(7): 797-805; 1975.* (32 references)

Neurotoxic esterase is one of several paraoxon-resistant esterases of hen brain. It has previously been assayed with phenyl phenylacetate as substrate by a differential assay using Mipafox (DFP) as selective inhibitor. The Mipafox-sensitive activity is a greater proportion (55 per cent) of the total when phenyl valerate is used as substrate and this activity behaves as a single enzyme according to several tests. Phenyl esters of other acids and esters of other phenols are less specific substrates and most are hydrolyzed slower than phenyl valerate. Neurotoxic esterase does not significantly hydrolyze peptides or amides but some hydrophobic peptides and amines are non-progressive inhibitors. Inhibition by a range of organophosphorus, carbamic, and sulfur-acid esters has been investigated. Neurotoxic esterase is similar to chymotrypsin and trypsin but unlike acetylcholinesterase in the pattern of inhibition by organophosphorus esters. The structure-activity relationships presented give some guidance for design of non-neurotoxic pesticides. More stable and less toxic alternatives to Mipafox as a selective inhibitor of neurotoxic esterase have been found. Benzenesulfonyl fluoride is a selective inhibitor of some of the Mipafox-resistant esterases. All the esterases were inhibited by PCMB (0.1 m*M*) and by Zn^{21} (0.4 m*M*). (Author abstract by permission)

75-1119. Satyanarayana, T.; Getzin, L. W. (Western Washington Res. Extension Cent., Washington State Univ., Puyallup, WA 98371). **Properties of a stable cell-free esterase from soil.** *Biochemistry 12(8): 1566-1572; 1973.* (22 references)

The properties of a stable, extracellular phenyl esterase which hydrolyzes the organophosphorus insecticide malathion to its monoacid were investigated following its isolation from the soil by 0.2 *N* alkali extraction and 560-fold purification by $MnCl_2$ treatment, protamine sulfate treatment, and QAE Sephadex A-50 chromatography. Phosphonate and phenyl thiophosphate anticholinesterase insectides were potent competitive inhibitors of soil esterase activity. Inhibition was also observed with mono- and dithiols, but not with diisopropyl fluorophosphate or sulfhydrol compounds. The esterase was not susceptible to enzymatic proteolysis nor easily inactivated by metal ions. The characteristic u.v. 280-nm absorption peak for proteins was not present unless the enzyme was first hydrolyzed in 6 N HCl or digested with testicular hyaluronidase. Hyaluronidase digestion increased the esterase activity almost 2-fold, but it also decreased the stability of the enzyme. On the basis of its chemical composition and response to hyaluronidase treatment, the enzyme is classified as a glycoenzyme. The proposed carbohydrate-protein complex may account for the enzyme's unusual stability and persistence in the soil as an extracellular entity.

75-1120. Hamilton, S. E.; Dudman, N. P. B.; De Jersey, J.; Stoops, J. K.*; Zerner, B. (Dep. Biochem., Univ. Queensland, St. Lucia, Queensland, Australia). **Organophosphate inhibitors: the reactions of bis(*p*-nitrophenyl) methyl phosphate with liver carboxylesterases and α-chymotrypsin.** *Biochim. Biophys. Acta 377(2): 282-296; 1975.* (24 references)

Bis(*p*-nitrophenyl) methyl phosphate (BNMP) has been tested as a spectrophotometric titrant for a group of serine hydrolases. Bis(*p*-nitrophenyl) methyl phospate reacts rapidly with liver carboxylesterases from chicken, sheep, and horse, and more slowly with α-chymotrypsin, releasing 2 mol of *p*-nitrophenol per active site titrated, and producing a phosphorylated enzyme very stable to dephosphorylation. However, pig liver carboxylesterase produces 2.2 mol of *p*-nitrophenol per active site titrated. Reaction of pig and chicken liver carboxylesterase with bis(*p*-nitrophenyl) [^{3}H] methyl [^{32}P] phosphate clarified this difference. One molecule of the chicken enzyme reacts with one molecule of bis(*p*-nitrophenyl) methyl phosphate, releasing both *p*-nitrophenol residues, and resulting in an inhibited enzyme with one phosophorus atom and one methyl group covalently bound. Pig enzyme reacts rapidly, forming (presumably) methyl *p*-nitrophenyl phosphoryl-carboxylesterase. This further reacts, concurrently producing methyl phosphoryl-carboxylesterase plus *p*-nitrophenol, or free enzymye plus methyl *p*-nitrophenyl phosphate, in the ratio of about 5:1 at pH 7.55. The free enzyme produced undergoes further reaction with bis(*p*-nitrophenyl) methyl phosphate until all the carboxylesterase is inhibited. (Author abstract by permission)

75-1121. Thomson, J.; Cochrane, T.; Cochran, R.; McQueen, A. (Dep. Dermatol., Royal Infirm., Glasgow, Scotland). **Histology simulating reticulosis in persistent nodular scabies.** *Br. J. Dermatol. 90: 421-429; 1974.* (14 references)

Six patients (1 woman and 5 men, aged 31-65 yr) with persistent nodular scabies are described. Diagnosis of scabies was made on clinical grounds, confirmed in 2 cases by demonstrating the acarus microscopically in scrapings from a burrow, and in 1 case the acarus was seen transected in the hematoxylin and eosin preparation. The histological features in 4 cases suggested lymphoid neoplasm. In one case the features suggested the possibility of an adverse drug reaction, although a lymphoid neoplasm could not be excluded on histological grounds. In the remaining case the type and extent of dermal infiltrate was such that the possibility of a superimposed drug reaction was suggested. Histological appearances may be misleading and even with accurate clinical details the true diagnosis may be made only based on the subsequent progress of the patient. Two of these 6 patients received topical treatments with 1% benzene hydrochloride cream as part of their therapy.

75-1122. Campbell, R. D.; Leadem, T. P.; Johnson, D. W. (Dep. Biol., Idaho State Univ., Pocatello, ID). **The in vivo effect of *p,p'*-DDT on Na^+-K^+-activated ATPase activity in rainbow trout (*Salmo gairdneri*).** *Bull. Environ. Contam. Toxicol. 11(5): 425-428; 1974.* (7 references)

The in vivo effects of *p,p'*-DDT on branchial and renal Na^+-K^+-ATPase activity of rainbow trout is reported. A relation between enzyme inactivation and impairment of the rainbow trout's ability to maintain homeostasis is suggested. DDT was dissolved in corn oil and administered in gelatin capsules. Two insecticide concentrations, 2.75 mg/kg, and 8.30 mg/kg were administered on alternate days for a total of 7 treatments. Inhibition of Na^+-K^+-activated ATPase activity accompanied treatment with both insecticide concentrations in each of three salinities used. Highly significant differences in renal and branchial activities of fish treated with DDT compared with manipulated and non-manipulated control groups were noted. There appeared to be a relation between the level of pesticide encountered by rainbow trout and the percent inhibition of branchial Na^+-K^+-ATPase activity. A relation between salinity and propensity for inhibition also seems probable. Levels of renal ATPase inhibition, while statistically significant, exhibited no apparent differential response to either increasing salinity or increasing pesticide concentration for the range of combinations

employed. It is concluded that DDT is capable of inhibiting Na^+-K^+ATPase activities in tissues of chronically exposed rainbow trout. Detection of ATPase inactivation could be an important index to tolerable levels of a large group of environmental contaminants.

75-1123. Flashinski, S. J.; Lichtenstein, E. P.* (Dep. Entomol., Univ. Wisconsin, Madison, WI 53706). **Environmental factors affecting the degradation of Dyfonate by soil fungi.** *Can. J. Microbiol. 21(1): 17-25; 1975.* (7 references)

The ability of selected fungi to degrade the soil insecticide Dyfonate (*O*-ethyl *S*-phenyl ethylphosphonodithioate, fonofos) into water-soluble, noninsecticidal metabolites was found to be dependent on the supply of nutrients, incubation time, temperature, pH, as well as other factors. With yeast extract as the carbon source (5 g/liter) and ammonium nitrate (1 g/liter) as the nitrogen source, both *Rhizopus arrhizus* and *Penicillium notatum* degraded the insecticide to a larger extent than with any other combination of nutrients used. With glucose as the carbon source, concentrations of ammonium nitrate above 5 g/liter inhibited the degradation of Dyfonate by *R. arrhizus*. Time-course studies on the metabolism of the insecticide indicated that Dyfonate was first absorbed by the fungal mycelium where it was metabolized, followed by the release of water-soluble, noninsecticidal breakdown products into the culture media. The degradation appeared to involve the breakdown of Dyfonate into ethyl acetate soluble metabolites, such as ethylethoxyphosphonothioic acid, ethylethoxyphosphonic acid, methyl phenyl sulfoxide, and methyl phenyl sulfone. These compounds were then further degraded into water-soluble products. The optimum conditions for the degradation of the insecticide by *R. arrhizus* were observed at pH 6.0 to 7.0 and at 15-20°C. Aged fungal mycelia were as active as mycelia in the logarithmic growth phase. (Author abstract by permission)

75-1124. Loos, M. A. (Dep. Plant Pathol. Microbiol., Univ. Natal, Pietermaritzburg, South Africa). **Indicator media for microorganisms degrading chlorinated pesticides.** *Can. J. Microbiol. 21(1): 104-107; 1975.* (7 references)

A bromocresol purple liquid indicator medium and an eosin-methylene blue agar have been developed for the demonstration and isolation of microorganisms able to degrade the chlorinated herbicide, 2,4-dichlorophenoxyacetic acid (2,4-D). Plates of the eosin-methylene blue agar indicated individual 2,4-D-degrading bacterial colonies. Both indicator systems show the production of acid, presumably hydrochloric, during degradation of the 2,4-D in the media. Concentrations of 2,4-D required to give an acid reaction in media with varying concentrations of yeast extract were determined; the production of about 0.24 mmol of hydrochloric acid seems necessary to counteract the buffering effect of 100 mg of metabolized yeast extract. Acid production from the herbicide, 4-chloro-2-methylphenoxyacetic acid (MCPA), which in the salt form could yield only small amounts of hydrochloric acid, was inconsistent. The two indicator media should be useful in investigations of the microbial degradation of other acid-yielding halogenated pesticides. (Author abstract by permission)

75-1125. Polin, D.; Ringer, R. K. (Dep. Poult. Sci., Michigan State Univ., East Lansing, MI 48824). **Withdrawal rates of DDT from chickens treated with diphenylhydantoin.** *Can. J. Physiol. Pharmacol. 53(1): 166-173; 1975.* (22 references)

Male and female chickens of a broiler-type strain were fed, from 1 day old to 5 weeks of age, diets containing 0, 2.5, or 15.0 ppm (mg/kg) 1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)ethane (*p,p'*-DDT). Then the diets with pesticide were withdrawn and the chickens were fed dietary levels of diphenylhydantoin (DPH) at 0, 100, or 250 ppm. Adipose-tissue and liver samples were obtained on days 0, 10, 20, and 30 following withdrawal of diets with pesticides to determine DPH effect on DDT, 1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethylene (DDE), and 1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethane (DDD) levels. DPH had no effect on the concentration of DDT and DDE in adipose tissue; their levels declined at a rate having a half-life value of 16 days. DDD was not detected in adipose tissue. DDT accounted for 87% of the adipose tissue residues on day 0, but 66% of the residues at day 30. DPH had no effect on the concentrations of DDT and DDE in livers of chickens fed 15.0 ppm DDT, but did significantly reduce the levels of DDD by 28 and 54% for levels of 100 and 250 ppm DPH, respectively. The similarity of these data to studies on dairy cows and humans, and the dissimilarity to data from rat studies were discussed. (Author abstract by permission)

75-1126. Weisbart, M.; Feiner, D. (Dep. Biol., Wayne State Univ., Detroit, MI 48202). **Sublethal effect of DDT on osmotic and ionic regulation by the goldfish,** *Carassius auratus. Can. J. Zool. 52(6): 739-744; 1974.* (18 references)

Goldfish treated with up to 35 parts per billion (ppb) of 1,1,1-trichloro-2,2-bis(*p*-chlorophenyl) ethane (DDT) for up to 330 hr in a running freshwater system showed significant but inconsistent decreases in plasma osmotic and sodium concentrations and a significant but inconsistent increase in potassium concentrations. Goldfish exposed to 17.5 ppb DDT for 330 hr and subsequently transferred to brackish water (synthetic) showed no significant differences in plasma electrolytes from solvent-treated goldfish. No correlation between pesticide concentrations and total lipid content of individual goldfish was found but for one exception. Fish exposed to higher doses showed higher pesticide levels in their bodies. The lack of correlation between in vitro and in vivo experiments is discussed. (Author abstract by permission)

75-1127. Docekal, O.; Halacka, K.; Petrasek, R. (OHS, Jihlava, Czechoslovakia). **Zmeny metabolismu DDT pri zvysene utilizaci depotniho tuku. [The changes of DDT metabolism in increased utilization of depot fat.]** *Cesk. Hyg. 18(6-7): 292-298; 1973.* (7 references) (Czech)

Changes in DDT metabolism were studied in rats under conditions of increased depot fat utilization due to fasting or undernutrition. The residue levels of DDT and its metabolites were observed in perirenal fat, brain, liver, and kidney of rats that were fed 5 or 50 ppm DDT daily for 42 days, and during subsequent fasting for 4 days. A significant increase in the DDT concentration in the brain (from 0.36 ppm to 1.02 ppm), and a marked increase in the DDD (TDE) level in the liver (from 0.4 ppm to 2.2 ppm) were observed during fasting in the 5 ppm group. In animals fed half the normal diet for 42 days, the liver DDD concentration was 1.34 ppm compared to 0.4 ppm in a group fed normal diet. Elimination of DDT in the form of DDA was observed in another group fed 50 ppm DDT daily for 35 days. The diurnal DDA excretion in the urine in the course of subsequent fasting and undernutrition increased by as much as 2.5 times. The findings appear to indicate that an abrupt mobilization of the depot fat may increase the neurotoxic effect of DDT and its toxic effect on the liver tissue.

75-1128. Chu, J. P. H. (Purdue Univ., Lafayette, IN). **Microbial degradation of pentachlorophenol and related chlorophenols.** *Diss. Abstr. Int. 34(1): 207B-208B; 1973.*

Degradation of pentachlorophenol (PCP) and related chlorophenols, solubilized as salts in buffered solutions, was studied using axenic cultures isolated from a PCP enrichment culture. Degradation was followed by UV spectrometry, radiotracer studies, and colorimetric determination of inorganic chloride released. A Gram-variable bacillus designated as KC-3, isolated from a mixed population, was able to utilize pentachlorophenol as a sole carbon source, with concurrent conversion of the PCP to carbon dioxide and chloride. Only 2,3,4,6-tetrachlorophenol and 2,4,6-trichlorophenol, of 19 chlorophenols and unsubstituted phenol tested, were able to support the growth of KC-3. PCP metabolism by KC-3 was inducible. Despite its catabolic ability for PCP and other chlorophenols, KC-3 was sensitive to chlorophenol inhibition. Under selected experimental conditions all multichlorinated phenols could be utilized to some extent by KC-3, while monochlorophenols and the unsubstituted phenols were not catabolized. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-15,788.)

75-1129. Reif, V. D.; Sinsheimer, J. E.* (Coll. Pharm., Univ. Michigan, Ann Arbor, MI 48104). **Metabolism of 1-(*o*-chlorophenyl)-1-(*p*-chlorophenyl)-2,2-dichloroethane (*o,p'*-DDD) in rats.** *Drug. Metab. Disposition 3(1): 15-25; 1975.* (18 references)

The metabolism of ^{14}C-labeled *o,p'*-DDD (TDE) was studied using male Sprague-Dawley rats. The metabolites were identified in fecal and urinary extracts by thin-layer chromatography (TLC), gas-liquid chromatography, and mass spectrometry. Extracts of acidic metabolites were methylated with diazomethane for identification, and the metabolites were quantitated by TLC and liquid scintillation counting. After a 100-mg oral dose to each of three rats, an average of 7.1% of the radioactivity was excreted in the urine and 87.8% was excreted in the feces within 8 days. The urine contained *o,p'*-DDA and 4-hydroxy-, 3-hydroxy-, and 3,4-dihydroxy-substituted *o,p'*-DDA. The serine and glycine conjugates of *o,p'*-DDA were also identified. In addition to these metabolites, the feces contained *o,p'*-DDD, 1-(*o*-chlorophenyl)-1-(*p*-chlorophenyl)-2-chloroethylene, and the aspartic acid conjugate of *o,p'*-DDA. The feces also contained mono- and dihydroxylated *o,p'*-DDD.

75-1130. Gingell, R. (Eppley Inst. Res. Cancer, Univ. Nebraska Med. Cent., Omaha, NB 68105). **Enterohepatic circulation of bis(*p*-chlorophenyl)acetic acid in the rat.** *Drug. Metab. Disposition 3(1): 42-46; 1975.* (13 references)

Following the i.v. administration of ^{14}C-DDA (25 mg/kg) to biliary cannulated Wistar albino rats, 97% of the radioactivity was recovered in the bile within 24 hours. When ^{14}C-DDT (25 mg/kg in olive oil) was administered orally, approximately 8% of the dose was recovered in the bile within 3 days. The bile metabolite in each case was a conjugate of DDA, probably with glucuronic acid. Thus, less than 10% of a single dose of DDT was metabolized to DDA. The biliary metabolite was shown by two methods to undergo extensive enterohepatic circulation. In intact animals, the DDA formed from DDT probably undergoes extensive enterohepatic circulation, which would maintain higher DDA blood levels for longer periods and favor increased urinary excretion. Approximately 70% of the total dose of DDT is probably deposited in the adipose and other tissues and slowly metabolized and excreted.

75-1131. Grant, D. L.; Iverson, F.; Hatina, G. V.; Villeneuve, D. C. (Food Res. Labs., Health Protection Branch, Natl. Health Welfare, Ottawa, Canada). **Effects of hexachlorobenzene on liver porphyrin levels and microsomal enzymes in the rat.** *Environ. Physiol. Biochem. 4(4): 159-165; 1974.* (31 references)

Male and female Sprague-Dawley rats were maintained for 9 or 10 months on diets containing hexachlorobenzene (HCB) (10, 20, 40, 80, or 160 ppm). At the end of the experimental period, HCB residues in the liver were dose related and independent of sex. The liver:body weight ratios increased in male and female

animals fed 80 or 160 ppm HCB. Among the females fed the two highest dose levels, weight gain was reduced. The in vitro activities of hepatic aniline hydroxylase and *N*-demethylase and the levels of cytochrome P-450 were increased in males fed 40 ppm or more HCB but were unaltered in the females at all dietary levels. The pharmacological actions of pentobarbital and zoxazolamine were shortened in males and females fed 20 ppm or more. The female rats acquired chemical porphyria readily, while the males appeared resistant.

75-1132. Cikrt, M.; Tichy, M. (Inst. Hyg. Epidemiol., Prague, Czechoslovakia). **Biliary excretion of phenyl- and methyl mercury chlorides and their enterohepatic circulation in rats.** *Environ. Res. 8(1): 71-81; 1974.* (20 references)

The kinetics of biliary excretion of mercury applied as phenyl mercury (203) chloride (PMC) or methyl mercury (203) chloride (MMC) were studied in rats during the first 24 hours after intravenous administration. The content of total mercury in the bile, plasma, liver, kidneys, gastrointestinal tract, urine, and feces was determined. The enterohepatic circulation of mercury after administration of PMC in rats was compared with that after administration of MMC or inorganic mercury. The differences found in both the kinetics and the distribution of PMC, MMC, and inorganic mercury in rats were discussed. (Author abstract by permission of Academic Press)

75-1133. Schein, L. G.; Thomas, J. A. (Dep. Pharmacol., West Virginia Univ. Med. Cent., Morgantown, WV 26506). **Effects of dieldrin on the uptake and metabolism of testosterone-1,2-^{3}H by rodent sex accessory organs.** *Environ. Res. 9: 26-31; 1975.* (7 references)

The oral administration of dieldrin (1.25, 2.50, or 5.00 mg/kg daily × 5) significantly reduced the total uptake and subsequent metabolism of labeled androgens in the mouse anterior prostate gland. The in vivo metabolism of testosterone-1,2-^{3}H to dihydrotestosterone-^{3}H (DHT-^{3}H), androstanediol-^{3}H, or androstenedione-^{3}H by the mouse prostate gland was lowered by pretreatment with dieldrin. Similarly, the in vitro metabolism of testosterone-1,2-^{3}H to these aforementioned radiometabolites was reduced by dieldrin at a treatment level of 5 mg/kg (daily × 5). This highest-dose regimen also reduced the formation of the metabolites of testosterone in mouse hepatic microsomes. Varying concentrations of dieldrin (4×10^{-7}, 4×10^{-6}, or 2×10^{-5} *M*) in vitro effectively decreased the formation of DHT-H^3 in the mouse anterior prostate gland and of androstanediol-^{3}H in the rat ventral prostate gland. (Author abstract by permission of Academic Press)

75-1134. Paris, D. F.; Lewis, D. L.; Wolfe, N. L. (U.S. Environ. Protect. Agency, Southeast Environ. Res. Lab., Athens, GA 30601). **Rates of degradation of malathion by bacteria isolated from aquatic system.** *Environ. Sci. Technol. 9(2): 135-138; 1975.* (18 references)

A heterogeneous bacterial population that grew in culture solution with *O,O*-dimethyl *S*-(1,2-dicarbethoxy)-ethylphosphorodithioate (malathion) as the only extraneous source of carbon has been isolated. Gas-liquid chromatographic analysis of methylated samples from the cultures showed that the major metabolite was β-malathion monoacid. Only 1% of the malathion was transformed to malathion dicarboxylic acid, *O,O*-dimethyl phosphorodithioic acid, and diethyl maleate. At low concentrations of malathion (less than the value of *K*s) and low concentrations of bacteria, the rate of bacterial degradation can be described mathematically by a second order rate expression. System analysis may find this kinetic expression useful in the construction of models. (Author abstract reprinted by permission of the American Chemical Society)

75-1135. Strik, J. J. T. W. A. (Inst. Vet. Pharmacol. Toxicol., State Univ., Utrecht, The Netherlands). **Chemical porphyria in Japanese quail (*Coturnix c. japonica*).** *Enzyme 16(1-6): 211-223; 1973.* (13 references)

The compounds allylisopropylacetamide (AIA), 3,5-dicarbethoxy-1,4-dihydrocollidine (DDC), hexachlorobenzene (HCB), and hexabromobiphenyl (HBB) were given p.o. in gelatin capsules to Japanese quail. Polyhalogenated aromatic compounds produce a different type of porphyria when compared with AIA and DDC. HCB and HBB evoke a cytoplasmic porphyria characterized by porphyria with 7- and 8-carboxy groups in the kidney. This type of porphyria is correlated with weight loss, tremor, and death. AIA and DDC provoke a hepatic protoporphyria not assocaited with weight loss or death. HCB action is slow starting, whereas AIA and DDC immediately produce significant accumulations of porphyrins in the kidney or in the kidney and liver, respectively. Aminoleavulinic acid synthetase (ALAS) activities are increased in all cases. In HCB and HBB porphyria, the activities are slightly increased long before porphyria develops. Accumulation of porphyrins in the kidneys of animals dosed with AIA and DDC is caused by high ALAS levels in liver and blood. No porphyrin in blood could be detected. Hemin suppressed the increase of ALAS in liver and accumulation of porphyrins in the bile caused by a single dose of AIA and DDC or by HCB or HBB. However, accumulation of porphyrins caused by dosing HBB for 7 days could not be so suppressed. Lowering of the heme content of the liver by AIA and HCB is not correlated with accumulation of porphyrin in the liver. A decrease of the heme content is correlated with ALAS activity. It is concluded that accumulation of porphyrins caused by HCB and HBB is not simply related to an increase of ALAS activity in the liver but to liver damage (especially the mitochondria). Heme exerts no feedback function in this type of porphyria.

75-1136. De Matteis, F. (Med. Res. Council, Carshalton, England). **Drug interactions in experimental hepatic porphyria. A model for the exacerbation by drugs of human variegate porphyria.** *Enzyme 16(1-6): 266-275; 1973.* (16 references)

When lindane is given to rats, it stimulates 5-aminolaevulinate (ALA) synthetase slightly, without causing accumulation of the intermediates of the pathway. However, when lindane is administered together with either 2-allyl-isopropyl-acetamide (AIA) or 3,5-diethoxycarbonyl-1,4-dihydrocollidine (DDC), a much greater accumulation of porphyrins and stimulation of 5-aminolaevulinate synthetase occurs than observed with DDC alone. Also, large amounts of the porphyrin precursors 5-ALA and porphobilinogen are accumulated in the liver. It is suggested that AIA or DDC may decrease the concentration of heme available for regulation of cytochrome P-450 apoprotein, may increase heme utilization and thereby decrease the concentration of this "regulatory" heme still further.

75-1137. Joubert, S. M.; Taljaard, J. J. F.; Shanley, B. C. (South African Med. Res. Council, Congella, South Africa). **Aetiological relationship between hepatic siderosis and symptomatic porphyria cutanea tarda. Evidence based on work in Durban.** *Enzyme 16(1-6): 305-313; 1973.* (9 references)

A comprehensive study of 100 patients with porphyria cutanea tarda was made about 12 years ago. The only consistent abnormality in all patients was the presence of hepatic siderosis. In further studies it was evident that not all siderotics had porphyria cutanea tarda. Animal studies based on HCB administration are reviewed; these suggest that limitation in the decarboxylation of uroporphyrinogen by inhibition of the appropriate decarboxylase and possibly also by oxidation of the porphyrinogen intermediates occurs. Human studies are also reviewed and the findings are clearly consistent with limitations in the decarboxylation of uroporphyrinogen. It is suggested that the limitation only occurs in those liver cells which fluoresce in UV light and that the lower carboxylated porphyrins are derived from the non-fluorescent hepatocytes in porphyria cutanea tarda, thus accounting for the fact that the excretion of the lower carboxylated porphyrins in porphyria cutanea tarda is not decreased. The proposal that 8-, 7-, and 6-carboxyl porphyrins have their origins in the fluorescent hepatocytes and 5- and 4-carboxyl porphyrins in the non-fluorescent hepatocytes in porphyria cutanea tarda accounts for the isomer composition of the urinary porphyrins. All these results suggest that a small hepatic iron pool developed in siderosis which limits the decarboxylation of uroporphyrinogen, under conditions as yet undefined.

75-1138. Matin, M. A. (Industrial Toxicol. Res. Cent., Lucknow, India). **Effect of paraoxon on cholinesterase activity in certain brain regions of diabetic rats.** *Eur. J. Pharmacol. 29(1): 168-170; 1974.* (16 references)

Adult male Sprague-Dawley rats were made diabetic by the i.p. injection of alloxan (120 mg/kg) twice at 48 hr intervals. Diabetic rats were given paraoxon (0.1 mg/kg, s.c.) or insulin (0.5 U/100 g, i.p.) or both at 48 hr after the last alloxan injection, and sacrificed 30 min after that. Paraoxon significantly inhibited cholinesterase activity in the cerebral cortex and striatum to 33 and 25% in control animals. This inhibitory effect was significantly reduced in diabetic animals. However, when diabetic rats received insulin along with paraoxon, the effects observed were similar to those seen in the control animals. It is noted that the activity of cholinesterase in diabetic rats did not differ from that observed in control animals. Further, the administration of insulin had no effect on the cholinesterase activity in either cortex or striatum of diabetic rats. Therefore, the diabetic state per se does not produce any change in the cholinesterase activity of these two brain regions. It is suggested that in alloxan-induced diabetes, where there is a deficiency of insulin in the body, the permeability of various biological membranes to paraoxon might be impaired. This would reduce access of paraoxon to brain cholinesterase and hence would reduce the degree of inhibition. As the inhibition of cholinesterase is directly related to the toxicity of organophosphate compounds, and because the cholinesterase inhibiting effect of paraoxon in diabetic animals is significantly reduced, it is possible that the diabetic state may in some way influence or modify the toxicity of paraoxon.

75-1139. Gazzard, M. F.; Thomas, D. P. (Med. Div., Chem. Defence Establ., Porton Down, Salisbury, Wilts, England). **A comparative study of central visual field changes induced by sarin vapor and physostigmine eye drops.** *Exp. Eye Res. 20(1): 15-21; 1975.* (11 references)

A Friedmann visual field analyzer was used to study the threshold luminance of multiple stimuli within the central visual field in humans made miotic by exposure to sarin vapor (0.5 mg/m^3 for 30 min). Using the same subjects, the observations were compared with the effects produced by an identical degree of miosis induced by the instillation of physostigmine (0.03 ml of 0.5%). Physostigmine instillation necessitated an increase in stimulus luminance, suggesting a reduction in effective retinal sensitivity when compared with corresponding controls. However, after sarin vapor exposure, a clinically significant gradation in threshold values was found in 3 of 10 observations when outer and central rings were compared, one of which showed an increase in retinal sensitivity towards the point of fixation. Another 2 gave a reverse effect, i.e., retinal sensitivity decreased towards the center. The remaining 7 observations showed little or no variation. When comparing post-physostigmine and post-sarin fields, about 50% showed a decrease in the sensitivity of the retina to light stimulus

after sarin exposure. About 20% showed the opposite effect, while 30% showed no sensitivity change. This study does not provide statistical confirmation that the effect of sarin vapor on the visual threshold differs from that of locally applied physostigmine eye drops. However, there was a trend for visual stimuli to be perceived less readily after sarin vapor exposure, compared with conditions after physostigmine. It is suggested that sarin differentially affects the rods and cones, influencing cone more than rod function, possibly by modifying acetylcholine-mediated neurotransmission within the retina or central visual pathways.

75-1140. Bollag, J. M.; Liu, K. C. (Dep. Agron., Pennsylvania State Univ., University Park, PA 16802). **Effect of methylenedioxyphenyl synergists on metabolism of carbaryl by *Aspergillus terreus*.** *Experientia 30(12): 1374-1375; 1974.* (7 references)

The methylenedioxyphenyl synergists sesamex and sesamol inhibit the transformation of the insecticide carbaryl (1-naphthyl-*N*-methyl carbamate) to *N*-hydroxymethyl carbamate and 1-naphthyl carbamate by *Aspergillus terreus*. The effects of the two synergists, however, are of limited duration, since they are metabolized by the fungus. (Author abstract by permission, translated)

75-1141. Singh, G. (Div. Entomol., G. B. Pant Univ. Agric. Technol., Pantnagar, Nainital, U.P., India). **Endosymbiotic microorganisms in *Cletus signatus* Walker (Coreidae: Heteroptera).** *Experientia 30(12): 1406-1407; 1974.* (7 references)

Symbiotic bacteria were isolated from the bug *Cletus signatus* Walker, cultured in vitro, and temporarily named *Bacillus cereus* var. *signatus*. The bacteria are transmitted via the insect ovaries. Attempts to produce aposymbiotic bugs by treating the insects with various concentrations of antibiotics were unsuccessful. Cultured symbiotes degraded 29 μg of DDT, 820 μg of parathion, and 18 μg of carbaryl when definite quantities of these insecticides in acetone solution were incubated with symbiotes in nutrient broth for 6 hr. Such degradation by the cultured symbiotes of apple maggot was previously studied.

75-1142. Stuneyeva, G. I. (I. P. Pavlov Ryazan Med. Inst., Ryazan, USSR). **O toksicheskikh svoystvakh smesi kel'tana, khlorofosa i khlorokisi medi. [Toxicity of mixtures of kelthane, trichlorfon, and copper chloride.]** *Gig. Sanit. 39(10): 102-103; 1974.* (1 reference) (Russian)

The acute and chronic toxicity of trichlorfon, kelthane, and copper chloride, as well as of mixtures of these were studied in albino rats. The acute LD50 values were 630±47.6 mg/kg for trichlorfon, 890±69.7 mg/kg for kelthane, 812±16 mg/kg for copper chloride, and 1270±101.1 mg/kg for the mixture, indicating antagonistic effects of the three different compounds. The weight gain was lowest in animals fed copper chloride, and the cholinesterase activity was lowest in animals fed trichlorfon or a mixture of the three compounds in subacute experiments. The reduction of the cholinesterase activity involved the erythrocytes, serum, brain, liver, and kidney. Copper chloride caused considerable increases in the aspartate amino transferase and alanine amino transferase activities in a 50-day experiment. Increase of the relative weights of the kidneys, liver, brain, heart, spleen, and stomach was observed in animals fed kelthane for 4 months. Atrophy of the gastric mucosa, hyperemia of the renal vessels, edema of the convoluted tubules, and corrugation of the glomerula were observed in rats fed a mixture of the three compounds for 4 months.

75-1143. Ubaydullayev, R. U.; Zelinskaya, O. V. (Uzbek Sci. Res. Inst. Sanit. Hyg., Occup. Dis., Tashkent, USSR). **Eksperimental'nyye issledovaniya po normirovaniyu mil'beksa v atmosfernom vozdukhe. [Experimental investigation for standardization of milbex in the atmosphere.]** *Gig. Sanit. 39(11): 6-8; 1974.* (1 reference) (Russian)

The reflex and resorptive action of milbex on humans and animals was studied for the standardization of milbex in the air. The odor threshold was determined to be 0.37 mg/m^3, and the subthreshold concentration was found to be 0.28 mg/m^3. At a concentration of 0.28 mg/m^3, milbex affected the bioelectric activity of the human brain, while a 0.19 mg/m^3 concentration was ineffective. Disturbances in the chronaxy of antagonistic muscles, changes in the ascorbic acid levels in the adrenals, and changes in the kidney cytochrome oxidase and succinate dehydrogenase activities were observed in white rats exposed to milbex at normal and especially at elevated temperatures for 3 months. On the basis of the chronic poisoning tests, the maximum allowable single-time and daily concentrations of milbex in the air of settlements are set at 0.20 and 0.10 mg/m^3, respectively.

75-1144. Matokhnyuk, L. A.; Matyushina, V. I.; Anina, I. A.; Khokhol'kova, G. A. (Inst. Ind. Hyg., Occup. Dis., Kiev, USSR). **Toksichnost' fungitsida kuprotsina pri ingalyatsionnom puti postupleniya v organizm. [Toxicity of the fungicide cuprozin following inhalation.]** *Gig. Tr. Prof. Zabol. 10: 59-60; 1974.* (4 references) (Russian)

Cuprozin is a mixture of copper and zinc dithiocarbamates with 27% zinc and 3% copper. The acute and chronic toxicity and effects of inhalation were studied in albino rats and cats. The LD50 was determined to be 10 g/kg in rats, and a low degree of accumulation was noted. When applied on the skin of rabbits, cuprozin in 1,000 mg/kg concentration failed to cause irritation. Exposure to 8 and 80 mg/m^3 concentrations increased the luekocyte level in the phagocytic activity of the neutrophils as well as in the aldolase, transaminase, and ceruloplasmin activities in chronic experiments. A

concentration of 21±3.4 mg/m^3 had no embryotoxic effect following inhalation by pregnant rats. The ineffective concentration was determined to be 1.5 mg/m^3. The maximum allowable workplace concentration of cuprozin is set at 0.5 mg/m^3 on the basis of the experimental results.

75-1145. Iwami, T.; Sone, K.; Takahashi, M.; Inokuchi, K.; Wakai, S.; Kimura, M. (Sch. Pharmacol., Fac. Med., Hirosaki Univ., Hirosaki, Aomori, Japan). **[Experimental studies on the percutaneous absorption of 3-(3,5-dichlorophenyl)-5,5-dimethyloxazolidinedione-2,4 (Sclex) in rabbit's skin.]** *Hirosaki Igaku (Hirosaki Med. J.) 26(3,4): 300-306; 1974.* (6 references)

A 0.1% suspension of 3(3′,5′-dichlorophenyl)-5,5-dimethyloxazolinedione-2,4 (dichlozoline, Sclex) in 0.5% aqueous CMC solution was painted once a day for six months on the shaved skin of the back of a rabbit. According to the results of examinations after one, three, and six months of the experimental period no appreciable change was detected in serum and liver ChE activities, RBC, WBC, and hemoglobin in comparison to controls, or in other aspects of the histopathological examination of major organs. Only hyperkeratosis of the epidermis was observed; however, this was due to the emulsifying action and covering properties of CMC. Atrophy of hair follicles and cellular infiltration of the corium were also attributable to the action of CMC as a surface active agent.

75-1146. Crawford, R. B.; Anderson, J. B.; Guarino, A. M. (Trinity Coll., Hartford, CT). **Effects of DDT on *Fundulus heteroclitus:* survival, uptake and distribution.** *Bull. Mt. Desert Isl. Biol. Lab. 12:19-22; 1972.*

The teleost *Fundulus heteroclitus* was used to study the effects of DDT on reproduction and embryogenesis. After 24 hr of treatment in 0.1 ppm DDT, over 90% of the fish survived. For similar periods of time, concentrations of 0.07, 0.05, and 0.01 ppm were not lethal. In other experiments, fish were subjected to DDT for 24-hr periods (at 0.10 and 0.05 ppm) and then spent 24 hr in water free of DDT. Fish could not tolerate additional doses at the 0.1 ppm level; however, several fish survived 4 treatments at 0.05 ppm interspersed with 24 hr free of the pesticide. In measurements of absorption of DDT, at least 50% of the dose was taken up by fish within the first 4 hr of exposure, confirming the ability of the *Fundulus* to concentrate this pesticide. Over half the absorbed dose was in the carcass, presumably within the muscle. However, the major quantity of DDT accumulated in the ovaries with significant quantities in the eggs, indicating maternal transport across egg membranes. Male fish incorporated DDT into testes at levels similar to those shown for eggs. A major portion of the insecticide was still present in the fish 8 days following removal from DDT-containing medium. Thus it is concluded that suitable preloading of *Fundulus* eggs with DDT can be accomplished by administration of the pesticide to females via uptake from the water. Further, more DDT is absorbed with less maternal toxicity if each 24-hr exposure period is followed by 24 hr in DDT-free water.

75-1147. Grant, W. C. Jr.; (Williams Coll., Williamstown, MA). **Observations on the effect of DDT in hermit crabs.** *Bull. Mt. Desert Isl. Biol. Lab. 12: 39-40; 1972.*

Studies were conducted on hermit crabs to determine whether they concentrate DDT directly from seawater, and might thus be useful as indicators of pesticide contamination. Animals of *Pagurus acadianus* and *P. pubescens* species were placed for 6 hr in 750 ml aerated seawater at 10-11°C containing 1.0, 0.5, and 0.1 ppm DDT. Survival at different DDT levels was approximately the same for both species even though average crab weight per unit volume in *P. pubescens* is about half that for *P. acadianus*. It is suggested that crabs either concentrate the pesticide at rates independent of body size, or that *P. pubescens* is generally a more resistent species. Behavior studies indicated differential effects of DDT concentration on individual items of behavior. Although ambulation was much impaired, crabs exposed to 0.5 ppm DDT oriented to empty mollusc shells but were unable to effect entry. In *P. acadianus* animals from 0.1 ppm DDT oriented to and entered shells but at times much longer than those required by controls. At similar concentrations, only 2 *P. pubescens* demonstrated successful behavior. These investigations indicate that hermit crab behavior may prove to be a reasonably sensitive indicator of DDT contamination in marine waters.

75-1148. Pritchard, J. B.; Peakall, D. B.; Risebrough, R. W.; Kinter, W. B. (Med. Univ. South Carolina, Charleston, SC). **DDE induced eggshell thinning in white pekin ducks *Anas platyrynchos:* structural, physiological, and biochemical studies.** *Bull. Mt. Desert Isl. Biol. Lab. 12: 77-79; 1972.*

Intake of 40 ppm DDT derived compound in the diet of 10 white pekin layers caused a 20% decrease in eggshell thickness after 4 days. Breaking strength of the shells was also significantly lowered. The weight loss was less for eggs from treated birds, despite significantly thinner shells. Thus oxygen and carbon dioxide exchange for embryonic development would also have been reduced; calculations indicate that the effective pore area was decreased by 38%. Scanning electron micrographs also revealed a rougher surface with more globular inclusions. After several weeks of treatment, the level of insecticide in the shell gland mucosa was about 1/20 of the 40 ppm dose, and in egg yolk it was about equal to the dietary level of 40 ppm. The blood level in treated ducks was about 0.4 ppm, compared to 0.004 ppm for untreated controls. The carbonic anhydrase activity of whole blood was unaffected. No difference was found in the activity of calcium binding protein

extracted from mucosa. Carbonic anhydrase did decrease with increased exposure in the mucosa of individual birds. In addition to ATPase dependent on Mg^{++} alone, both a Na^{+}-K^{+} and a Ca^{++} activated ATPase were demonstrated in the shell gland mucosa of laying ducks. It is suggested that as little as 2 ppm DDT derivative added under in vitro conditions inhibits both ion transporting ATPases by about 15%. The laying white pekin is a suitable experimental bird for investigating DDT derivative-induced eggshell thinning in general and the roles of shell gland ATPases and carbonic anhydrase in particular.

75-1149. De Matteis, F. (M.R.C. Toxicol. Unit, Carshalton, England). **Effect of drugs on 5-aminolaevulinate synthase. Differences in response between rat and chick liver cells.** *Hoppe-Seylers Z. Physiol. Chem. 354(8): 856; 1973.* (7 references)

Drugs such as 2-allyl-2-isopropylacetamide (AIA), 3,5-diethoxycarbonyl-1,4-dihydrocollidine (DDC), and griseofulvin stimulate 5-aminolaevulinate synthase in the liver of rodents, promote increased destruction of heme and/or inhibition of heme synthesis, and cause an early loss of cytochrome P-450. Drugs such as phenobarbital, thiopental, and lindane increase the concentration of cytrochrome P-450 and stimulate 5-aminolaevulinate synthase only slightly. When a drug of the second group is given with either AIA or DDC, the stimulation of 5-aminolaevulinate synthase caused by the drug of the latter group is greatly enhanced. A drug like thiopental is very effective as an inducer in the chick system when given alone, but only when given together with DDC in the rat. A possible reason for such differences between rat and chicken hepatocytes is that the chick cell already possesses intrinsically a lability in the regulation of the heme biosynthetic pathway, which makes its 5-aminolaevulinate synthase very sensitive to stimulation by a large variety of lipid soluble drugs. In rat liver, this lability must first be produced by a drug like AIA or DDC. The activity of Co^{2+}-mesoporphyrin chelatase (0.3 nmol/min/mg protein) of liver mitochondria from 6-week old chickens is only 25 and 15%, respectively, of the activity of rat and mouse liver mitochondria. A partial block in heme biosynthesis at the level of the chelatase may explain the greater sensitivity of the chick hepatocytes to several lipid soluble drugs.

75-1150. Joubert, S. M.; Taljaard, J. J. F.; Shanley, B. C. (Fac. Med., Univ. Natal, Natal, South Africa). **Aetiological relationship between hepatic siderosis and symptomatic porphyria cutanea tarda: evidence based on work in Durban.** *Hoppe-Seylers Z. Physiol. Chem. 354(8): 858; 1973.*

A group of 100 African patients with symptomatic porphyria cautanea tarda (SP) showed siderosis as the only liver pathology common to all. Hematological investigation indicated many had abnormal iron metabolism. An experimental model was developed in the siderotic hexachlorobenzene-fed rat, which had abnormalities similar to the abnormal porphyrin metabolism seen in human symptomatic porphyria cutanea tarda. Study of the model indicated that hexachlorobenzene profoundly affected iron distribution in the liver and that porphyrin accumulation in the liver was related to these changes. It was also noted that uroporphyrinogen decarboxylation was inhibited in the livers of these rats. Human studies showed that siderotic non-porphyric livers contained more higher carboxylated porphyrins and less lower carboxylated porphyrins, when compared with normosiderotic, non-porphyric livers. A limitation in the decarboxylation of uroporphyrinogen was also noted. The biochemical and clinical remissions achieved in SP patients treated with small doses of chloroquine were contingent on a concomitant urinary porphyrin and iron loss. Chloroquine did not affect urinary iron excretion in the absence of SP. Thus it is concluded that in SP a small active iron pool developed which limits decarboxylation of uroporphyrinogen in focal areas of the liver, resulting in free higher carboxylated porphyrin accumulation in these areas and their subsequent excretion in urine.

75-1151. Elder, G. H. (Welsh Sch. Med., Heath Park, Cardiff, Wales). **The metabolism of porphyrins of the isocoproporphyrin series.** *Hoppe-Seylers Z. Physiol. Chem. 354(8): 864; 1973.* (1 reference)

Patients with porphyria cutanea tarda symptomatica (PCTS) and rats with porphyria due to hexachlorobenzene poisoning excrete porphyrins of the isocoproporphyrin series in their feces. In patients with PCTS, isocoproporphyrin and deethylisocoproporphyrin together account for about 25% of the total porphyrin in the "coproporphyrin" and ether-insoluble porphyrin fractions from the feces, while dehydroisocoproporphyrin is the main ether-soluble portion in bile aspirated from the duodenum. In experiments with rats with hexachlorobenzene porphyria, dehydroisocoproporphyrin or the corresponding porphyrinogen is produced in the liver, excreted in the bile, and metabolized by intestinal microorganism to iso- and deethylisocoproporphyrin. Possible mechanisms for the formation of dehydroisocoproporphyrin are considered.

75-1152. Forster, M. S.; Gellert, R. J.; Heinrichs, W. L. R. (Univ. Washington Sch. Med., Seattle, WA). **The estrogenic capacity of organochlorine pesticides.** *Gynecol. Invest. 5(1): 35-36; 1974.*

The ability of DDT to reduce plasma gonadotrophin levels in castrated females and to produce the persistent estrous syndrome in neonatally-treated rats has been demonstrated. Several homologs of DDT were tested for their inhibitory ability on the in vivo and in vitro specific binding of ^{3}H-estradiol ($8.7X10^{-9}M$) in uterine cytosol and nuclear fractions. Oral treatment of pregnant dams (days 15-19 of gestation) with 10 mg

daily of TDE and DDT and DDT-derived compounds was ineffective in producing the persistent estrous syndrome in the offspring. Treatment of pups with TDE or DDT, 1 mg SQ daily X 3, produced the syndrome in females but did not disturb reproductive development of males. DDT derived compounds, DDA and *o,p'*-DDE, were ineffective. Plasma gonadotrophin (FSH AND LH) responses to ovariectomy of adults with the persistent estrous syndrome were blunted. This data confirms the estrogenic capacity of large amounts of DDT in the uterus and central nervous system and demonstrates a selective estrogenic effect of other organochlorine pesticides in these organs.

75-1153. Rajamanickam, C.; Padmanaban, G. (Dep. Biochem., Indian Inst. Sci., Bangalore, India). **Biochemical effects of hexachlorobenzene.** *Indian J. Biochem. Biophys. 11(2): 119-122; 1974.* (26 references)

Hexachlorobenzene was fed to adult female rats at 0.2 or 2.0% of the diet. At the 0.2% level, hexachlorobenzene increased liver weight, microsomal protein content, and the level of cytochrome P-450 without increasing δ-aminolaevulinate synthetase, the rate-limiting enzyme of the heme biosynthetic pathway. The dissociation between the effect on heme synthesis and that on the endoplasmic reticulum was not discernible when hexachlorobenzene was fed at the 2.0% level. Like phenobarbital, hexachlorobenzene (1.0%) increased the RNA, microsomal protein, and phospholipid contents, and both drugs depressed the ribonuclease activity. With hexachlorobenzene, there was an increase in NADPH-cytochrome *c* reductase with no change in the activity of aniline hydroxylase. Although the action of hexachlorobenzene was similar to that of phenobarbital in most respects, the effects of the former, unlike those of the latter, were not repressed by exogenous hematin.

75-1154. Namdeo, K. N.; Dube, J. N. (Dep. Agron., Coll. Agric., Rewa, India). **Ureolytic microflora, urease and ureolysis in urea and herbicide applied grassland soil.** *Indian J. Exp. Biol. 11(6): 548-550; 1973.* (21 references)

Urea-N (100 or 200 kg/ha in 10 replications), dalapon (10 kg/ha), and paraquat (3.75 kg/ha) were applied singly and in various combinations to a grassland sward for renovation and the long-term effects on the ecology of ureolytic microflora, urease activity, and ureolysis were studied. Residual urea-N and herbicide increased the ureolytic microflora by 36-171%, while paraquat in combination with urea-N reduced the ureolytic actinomycetes by 57%. These chemicals also had a stimulatory effect on urease. The retention of 92-920 ppm urea-N in a continuous flow procedure was comparatively higher in the paraquat treated field soil, and the recovery of urea-N in the effluent samples varied with time. The initial priming effect of nitrification was apparent in all cases. The phenomenon of ureolysis and the concomitant nitrification in grassland soil need characterization in mathematical terms.

75-1155. Chauhan, U. P. S.; Rastogi, V. K.; Jaggi, C. B.; Sarkar, B. C. R. (Inst. Nuclear Med. Allied Sci., Delhi, India). **Effect of acute malathion poisoning on acetylcholinesterase in various tissues of rat.** *Indian J. Exp. Biol. 11(6): 576-578; 1973.* (6 references)

Technical grade malathion was administered i.p. to 3-month-old female Sprague-Dawley albino rats. The LD50 was 741±49 mg/kg. Tremor started within 20 minutes and all deaths took place within 3 hours. The activity of acetylcholinesterase (AChE) was decreased in a dose-dependent fashion in the brain and, with doses of 400 mg/kg or more, was significantly decreased in the heart, liver, spleen, and red blood cells. Plasma AChE was little changed, even by doses of 800 mg/kg. Death occurred when the brain AChE activity was inhibited by 80% or more. Although the rate of inhibition of AChE was faster in the brain, heart, spleen, and blood than in the liver, kidney, and plasma, the recovery of enzyme activity was faster in the spleen, kidney, and whole blood.

75-1156. Agnihotri, V. P. (Indian Inst. Sugarcane Res., Lucknow, India). **Thiram induced changes in soil microflora, their physiological activity and control of damping-off in chillies (*Capsicum annum*).** *Indian J. Exp. Biol. 12(1): 85-88; 1974.* (22 references)

Treatment of garden soil with thiram (65% tetramethyl-thiuram disulfide) at 375, 187.5, and 93.7 ppm active ingredient had a significant disruptive effect on soil microbes, particularly fungi and actinomycetes. The population of spore-forming bacteria increased until the seventh day, then gradually decreased through the twenty-first day; on the thirty-fifth day, the treated soils did not differ significantly from nontreated control plots. Thiram also affected the physiological activity of the soil microbes. The fungicide impaired the process of nitrification, while ammonification remained unaffected as indicated by a considerable accumulation of ammonia nitrogen in the treated soils. The amount of available phosphorus also increased following fungicide application. The soil application of thiram at all levels and seed treatment (0.1%) effectively controlled the damping-off of chillies (*Capsicum annum*) caused by *Pythium irregulare*: soil treatment was more effective than seed treatment. The seedlings grown in thiram treated soil (93.7 ppm) were healthy with lush green foliage and developed profuse root systems.

75-1157. Cremlyn, R. J. W. (Dep. Chem. Sci., Hatfield Polytechnic, Hatfield, Hertfordshire, England). **Organophosphorus insecticides.** *Int. Pest Control 16(6): 4-9; 1974.* (45 references)

The article reviews the main types of organophos-

phorus insecticides. Early examples such as dimefox, tabun, sarin, pestox, and parathion had the disadvantage of high mammalian toxicity. Sumithion, which has a similar insecticidal spectrum to parathion, has a lower toxicity. A larger number of phosphorothioates have been developed which combine good insecticidal properties with very low mammalian toxicity, such as bromophos. Generally, the systox group, including systox, metasystox, or demetonmethyl, have fairly high mammalian toxicities and protective clothing is required when using these chemicals. Phorate, or Thimet is also a systemic insecticide with high mammalian toxicity. Malathion, developed in 1950, is an important and widely used contact insecticide and acaricide with remarkably low mammalian toxicity. Another important series of insecticides contains alkene double bonds such as dichlorvos. Mevinphos or phosdrin has replaced tetraethyl pyrophosphate as a contact insecticide where a rapid kill of a pest is required close to harvest. Though mevinphos is highly toxic, it is rapidly hydrolyzed in plants to non-toxic materials so that only 3 days are needed between the last application and harvesting of edible crops. One group of organophosphorus insecticides is obtained by combination with heterocyclic compounds, including menazon, and derivatives of phthalidide, benzotriazole, quanizolone, pyridines, quinolines, thiazoles, thiadiazoles, and diazines. Gusathion was one of the more active members of this series. Diazinon is another example. Another type of organophosphorus insecticide is the *N*-methylcarbamoyl derivative, dimethoate or Rogor. Dimethoate has a moderate mammalian toxicity and is not absorbed by the oily phase and thus has good residual properties. The insecticidal activity of a given organophosphorus compound is primarily related to its ability to phosphorylate cholinesterase, which in turn should be generally indicated by its reactivity as a phosphorylating agent for simple hydroxylic substrates. Still some very closely related compound exhibit markedly different activity, thus it is still necessary to synthesize a large number of analogous compounds and determine the optimum insecticide by trial and error. Potential advantages, selectively and toxicity of organophosphorus insecticides is briefly discussed.

75-1158. Quistad, G. B.; Staiger, L. E.; Schooley, D. A. (Zoecon Corp. Res. Lab., Palo Alto, CA 94304). **Environmental degradation of the insect growth regulator methoprene (isopropyl (2*E*,4*E*)-11-methoxy-3,7,11-trimethyl-2,4-dodecadienoate). I. Metabolism by alfalfa and rice.** *J. Agric. Food Chem. 22(4): 582-589; 1974.* (16 references)

The metabolic fate of isopropyl (2*E*,4*E*)-11-methoxy-3,7,11-trimethyl-2,4-dodecadienoate, a new insect growth regulator (common name, methoprene; trademark, Altosid), was studied in alfalfa and rice as a function of time. The major metabolic pathways involved ester hydrolysis, *O*-demethylation, and oxidative scission of the 4-ene double bond. The principal nonpolar metabolite was 7-methoxycitronellal which was isolated from vapors evolved from the plants. Chromatographic evidence strongly suggests the incorporation of radiolabel from the extensively degraded (2*E*)-[5-^{14}C]methoprene molecule into carotenoids, chlorophylls, and other higher molecular weight plant constituents. Yields of primary metabolites were grossly inflated (10X too high) unless thin layer chromatography was accompanied by prior purification by gel permeation chromatography because much radioactivity was attributed to coeluting natural products. Rapid metabolism of methoprene to biologically innocuous derivatives was characteristic of both rice and alfalfa. (Author abstract reprinted by permission of the American Chemical Society)

75-1159. Gilbert, M. D.; Pendergrass, A.; Isenberg, F. M.; Lisk, D. J.* (Dep. Food Sci. Vegetable Crops, Cornell Univ., Ithaca, NY 14850). **Fate of neodecanoic acid in onion and soil.** *J. Agric. Food Chem. 22(4): 589-592; 1974.* (6 references)

The metabolism of ^{14}C-carboxy-labeled neodecanoic acid (NDA) was studied in onions on which the compound is used for drying tops. It appeared that the compound was immobile in the plant and did not decompose appreciably. In muck soil about 10% of the added NDA decomposed with the release of $^{14}CO_2$ during the first 12 days after which $^{14}CO_2$ evolution was negligible. When onion foliage was added to muck soil containing labeled NDA, $^{14}CO_2$ was continuously evolved over a period of 30 days with little change in rate of evolution. (Author abstract reprinted by permission of the American Chemical Society)

75-1160. Raux, M. C.; Binoux, M.; Luton, J. P.; Gourmelen, M.; Girard, F. (Hopital Trousseau, Paris, France). **Studies of ACTH secretion control in 116 cases of Cushing's syndrome.** *J. Clin. Endocrinol. Metab. 40(2): 186-197; 1975.* (44 references)

The basal levels of ACTH and their variations were studied in 116 patients with Cushing's syndrome, 19 of them having pituitary tumors; some of the patients were followed up for periods up to 10 years. Tests included the dexamethasone suppression test, the metyrapone stimulation test, and the LVP stimulation test. Among 14 Cushing's syndrome patients without pituitary tumor, treatment with *o,p'*-DDD (TDE) resulted in some evidence of residual adrenal function. Adrenal function was totally abolished in 21 similar patients after surgical adrenalectomy, and persistent hypercortisolism was seen in four other patients after unilateral adrenalectomy.

75-1161. Aravindakshan, A.; Edward, G. J.; Ramachandran, M. (Natl. Inst. Communicable Diseases, Delhi, India). **DDT and its metabolites—storage and excretion**

in albino rats. *J. Commun. Dis. 6(1): 1-3; 1974.* (8 references)

Adult albino rats were given a single sublethal dose of technical DDT (2 mg/100 gm body weight, s.c.) in ethyl alcohol. After 5 days, the fat contained an average of 34.23 ppm total DDT and the blood contained 0.138 ppm. The urine, which was collected over the first 48 hours after treatment, contained an average of 0.2219 ppm. The blood and fat contained DDE as well as the two isomers of DDT; DDE was also found in the urine. The DDE content of rat fat is 45% lower than that in humans.

75-1162. Haley, T. J.; Farmer, J. H.; Dooley, K. L.; Harmon, J. R.; Peoples, A. (Natl. Cent. Toxicol. Res., Jefferson, AR 72079). **Determination of the LD01 and extrapolation of the LD001 for five methylcarbamate pesticides.** *J. Eur. Toxicol. 7(3): 152-158; 1974.* (9 references)

The oral LD50s (mg/kg) as determined in CD-1 strain male and female mice for five methylcarbamates are: formetanate, 25 and 16.6; carbaryl, 108 and 116; arprocarb (propoxur), 36.8 and 39; mexacarbate, 23.6 and 14.9; and C-8353 (dioxacarb), 77.5 and 61, respectively. Toxicity was greater in females with formetanate, mexacarbate, and C-8353. The concentration of the chemical greatly affects its toxicity, with 5 mg/ml more toxic than 10 mg/ml. The predicted LD01 and the extrapolated LD001 values have been determined from unbalanced designs, loaded heavily toward the lower end of the dose-response curve. The slopes of the curves obtained with groups of 50, 100, or 660 animals are parallel for all except formetanate in the 50 male mouse experiment. Sex dependence was observed in this series of experiments. A reversal in sex response was noted with C-8353 between the LD50 and LD01 experiments. Inhibition of brain cholinesterase by carbaryl at doses of 60 mg/kg (LD01) and 90 mg/kg (LD16) occurred rapidly and the mice recovered from the inhibitory effects at 3 and 24 hr, respectively. Thus, it is quite evident that a very small increase in dose can produce lethality in the most susceptible individual in a given population. It is imperative that control of human exposure to micropollutants be considered when such pesticides are dispersed if injury and/or death are to be prevented. This is of great importance to agricultural workers who may be exposed to low levels of esterase inhibitors for prolonged periods and, while not showing signs and symptoms of acute toxicity, may develop severe illness due to continuing and increasing inhibition of this vital enzyme.

75-1163. Peterson, R. H. (Fisheries and Marine Serv., Biol. Stn., St. Andrews, New Brunswick, Canada). **Influence of fenitrothion on swimming velocities of brook trout *Salvelinus fontinalis*).** *J. Fish. Res. Board Can. 31(11): 1757-1762; 1974.* (25 references)

The critical swimming velocities of brook trout (*Salvelinus fontinalis*) following exposure to 150, 500, and 1500 μg/liter fenitrothion were 100, 83, and 70%, respectively, of the performance of control fish. This represented 35 and 60% decreases in power output, respectively, for the two higher concentrations. At step-test intervals longer than 15 min, the critical velocity (ca. 4.5-5 lengths (L)/sec) was reasonably constant. At shorter step-test intervals, the critical velocity increased rapidly to exceed 7 L/sec at a step-test interval of 30 sec. The cruising speed of control fish was estimated at 4.5 L/sec. The influence of fenitrothion exposure on swimming speed is related to previous studies on sublethal effects of fenitrothion and to concentrations in streams resulting from insecticide spraying. (Author abstract by permission)

75-1164. Bull, C. J.; McInerney, J. E. (Dep. Recreation and Conservation, Fish and Wildl. Branch, Victoria, British Columbia, Canada). **Behavior of juvenile coho salmon (*Oncorhynchus kisutch*) exposed to sumithion (fenitrothion), an organophosphate insecticide.** *J. Fish. Res. Board Can. 31(12): 1867-1872; 1974.* (23 references)

Wild underyearling coho salmon, *Oncorhynchus kisutch*, in a stream aquarium were exposed to sublethal concentrations of the organophosphate insecticide Sumithion (0.10, 0.23, 0.48, and 0.75 ppm fenitrothion). After 2 hr exposure at 0.48 and 0.75 ppm the pattern of behavior changes indicated physiological impairment. All behaviors involving locomotion, including some comfort behaviors, virtually ceased. Many fish, unable to maintain position, were swept downstream. Only coughing increased in frequency with insecticide concentration, providing an indicator of physiological stress. In the 0-0.23 ppm range social behaviors and feeding markedly decreased in frequency whereas comfort movements generally increased; feeding was depressed at concentrations as low as 0.1 ppm. Of the various behaviors examined, feeding probably provides the best combination of a sensitive indicator of low level contamination by an organophosphate insecticide and a behavior with important ecological implications. (Author abstract by permission)

75-1165. Dill, P. A.; Saunders, R. C. (Dep. Biol., St. Francis Xavier Univ., Antigonish, Nova Scotia, Canada). **Retarded behavioral development and impaired balance in Atlantic salmon (*Salmo salar*) alevins hatched from gastrulae exposed to DDT.** *J. Fish. Res. Board Can. 31(12): 1936-1938; 1974.* (10 references)

Eggs of Atlantic salmon (*Salmo salar*) were subjected to 0.1, 0.05, 0.01, or 0.005 ppm DDT at gastrulation. Behavior of hatched fish was observed in DDT-free aquaria for about 30 days, and compared with that of controls. Exposure to the two higher concentrations of DDT retarded behavioral development and impaired balance. The consequences of such behavior changes to wild fish are discussed. (Author abstract by permission)

75-1166. Meith-Avcin, N. (Marine Biol. Stn., 66320 Portoroz, Yugoslavia). **DDT and the rugophilic response of settling barnacles *Balanus improvisus*.** *J. Fish. Res. Board Can. 31(12): 1960-1963; 1974.* (5 references)

Treatment of glass settling plates with DDT generally resulted in lowered settlement densities of the cyprids of *Balanus improvisus* and lowered indices of preference for roughened surfaces, indicating that DDT interferes with the cyprids' rugophilic response pattern to settlement surfaces. (Author abstract by permission)

75-1167. Greaves, J. H.; Redfern, R.; Tinworth, H. (Pest Infestation Control Lab., Ministry of Agric., Fisheries and Food, Hook Rise South, Surbiton, Surrey, England). **Laboratory tests of 5-*p*-chlorophenyl silatrane as a rodenticide.** *J. Hyg. 73(1): 39-43; 1974.* (7 references)

The rodenticide, 5-*p*-chlorophenyl silatrane was administered by stomach tube to Wistar rats and LAC Grey mice. Feeding experiments were conducted on the wild rodents, Norway rat (*Rattus norvegicus*) and the house mouse (*Mus musculus*), by offering them two baits, one poisoned and the other not. The mortality rate for oral intubation showed the LD50 values to be 1-4 mg/kg for rats and 0.2-2.0 mg/kg for mice. No evidence of subacute toxicity was found in animals given successive daily doses. Since the onset of illness is relatively early with 5-*p*-chlorophenyl silatrane, the opportunity for a rodent to ingest a lethal dose is correspondingly less than with some other rodenticides. This disadvantage may be overcome by increasing the concentration of the chemical in the bait. Feeding experiments for wild rodents indicated that the lowest concentrations worth testing in bait were 0.5% for rats and 0.1% for mice. It was felt that all surviving animals ate a sublethal dose of the rodenticide and then avoided eating a further, lethal dose either by feeding preferentially on the plain bait or by virtually refraining from eating at all for the remainder of the study. Mortality was not influenced by sex in either species or by resistance to warfarin in the rat. In mice the effect of increasing the concentration of poison in the bait was significant. Kills of 12/20, 17/20, and 19/20 were obtained at concentrations of 0.1, 0.25, and 0.5%, respectively. An increase in concentration from 0.5 to 1.0% in bait for rats resulted in an insignificant increase in mortality from 20/40 to 23/40, respectively. Thus 5% is considered the optimal dose for control of rats and house mice under field conditions. This chemical has advantages over other rodenticides, for the bait residues have low toxicity, low secondary poisoning hazard, and low percutaneous and subacute toxicity. However, the acute toxicity is high and the hazard due to accidental ingestion of fresh bait remains as great as with any other rodenticide.

75-1168. Prozorovskiy, V. B. (S. M. Kirov Military Med. Acad., Leningrad, USSR). **Kholinosensibiliziruyushcheye deystviye antikholinesteraznykh i drugikh kholinopotentsiruyushchikh sredstv. [Choline-sensitizing action of cholinesterase inhibitors and other choline-potentiating substances.]** *Farmakol. Toksikol. (Moscow) 37(4): 494-500; 1974.* (128 references) (Russian)

Studies on the choline-sensitizing action of cholinesterase inhibitors and other choline-potentiating substances are reviewed. The choline-sensitizing action is now regarded as an autonomous primary pharmacological reaction, which consists essentially in an increase of the affinity of part of the choline receptor for acetylcholine and its analogs and sometimes even for antagonists. Choline-sensitizing action is a characteristic feature of many different groups of chemical compounds and of nearly all cholinesterase inhibitors. In its mechanism, the choline-sensitizing action on the choline receptor is based on cooperative and allosteric activation, two phenomena which may be closely interrelated, and possibly on metabolic changes which entail as yet unknown but specific processes in the membrane receptors. Under physiological conditions, the mechanism of sensitization is used for the autoregulation of the choline receptors and for the cyclization of synaptic processes.

75-1169. Nadzhimutdinov, K. N.; Kamilov, I. K.; Muzrabekov, Sh. M. (Dep. Pharmacol., Tashkent Med. Inst., Tashkent, USSR). **Vliyaniye pestitsidov na dlitel'nost' geksenalovogo sna. [Influence of pesticides on the duration of hexobarbital-induced sleep.]** *Farmakol. Toksikol. (Moscow) 37(5): 533-537; 1974.* (21 references) (Russian)

The effect of BHC, TMTD, and butyphos on the duration of hexobarbital-induced sleep and on the morphological and biochemical status of the liver was studied in male rats that were administered 1/20 LD50 doses of these pesticides for 6 days, or 1/50 LD50 doses for 4 months daily through gastric tube. The animals were administered 95-110 mg/kg i.p. doses of hexobarbital. While butyphos had practically no effect, BHC reduced and TMTD increased the duration of the hexobarbital-induced sleep. Moderate stasis in the parenchymal vessels, round-cell element infiltration in the interlobular connective tissue, dystrophy of the parenchyma, hydropic degeneration and hypertrophy of the hepatocytes with hyperplasia of the smooth endoplasmatic reticulum, and increased RNA, protein, glycogen, and lipid contents were found in the livers of animals to which BHC was administered. Similar though less pronounced changes were observed in animals fed TMTD, in which group a decrease in the hepatic RNA, protein, and glycogen levels was noted. Hepatomegaly was caused by TMTD, and especially by BHC. The reduction of the duration of hexobarbital-induced sleep by BHC is due to its stimulating effect on the hepatic enzymes responsible for the metabolism of hexobarbital which indirectly manifests itself in the increased hepatic RNA, protein, glycogen, and lipid level.

75-1170. Zakirov, U. B.; Volokhvyanskiy, Ye. A.; Kadyrov, U. Z. (Dep. Pharmacol., Tashkent Med. Inst., Tashkent, USSR). **Vliyaniye geksakhlortsiklogeksana na aktivnost' fermentov tonkogo kishechnika. [The effect of hexachlorocyclohexane on the enzyme activity in the small intestine.]** *Farmakol. Toksikol. (Moscow) 37(5): 593-597; 1974.* (7 references) (Russian)

The effect of BHC with 96% lindane on the enzymatic activities in the small intestine of rats was studied. The rats were administered 1/50 and 1/20 LD50 doses of BHC daily for 0.5-6 months, 1/5 LD50 for 1 to 20 days, and a single 1/3 LD50 dose via stomach tube. Administered in 1/50 and 1/20 LD50 doses, BHC reduced the activity of monoglyceride lipase, glycylvaline dipeptidase, invertase, alkaline phosphatase, and amylase in the small intestinal mucosa. The activity of all these enzymes, except for that of amylase, first increased one month after the cessation of the administration. The amylase activity first rose 6 months after cessation of the administration of 1/50 and 1/20 LD50 doses. In a dose of 1/5 LD50, BHC depressed the activity of dipeptidase, invertase, and amylase starting from the 3rd day, that of lipase starting from the 10th day, and that of phosphatase starting from the 20th day of the experiment. The single 1/3 LD50 dose depressed the activities of all these enzymes except for that of amylase within 24 hours. The enzymatic activity normalized 15 days after the administration of the single 1/3 LD50 doses.

75-1171. Vrochinskiy, K. K.; Perlovskaya, E. D.; Kazachuk, Yu. S. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, Plastic Materials, Kiev, USSR). **Nekotoryye funktsional'nyye i morfologicheskiye izmeneniya, razvivayushchiyesya v organizme teplokrovnykh zhivotnykh pri intoksikatsii fenuronom. [Some functional and morphological alterations occurring in the organism of warm-blooded animals in fenuron poisoning.]** *Farmakol. Toksikol. (Moscow) 37(5): 604-607; 1974.* (11 references) (Russian)

Functional and morphological changes caused by fenuron were studied in guinea pigs fed daily 150, 64, and 15 mg/kg doses of this compound through gastric tube for 10 months. Anemia, hypothyroidism, phasic changes in the function of the adrenal gland with reduced ascorbic acid level, reduction of the erythrocyte, hemoglobin, and blood protein SH group levels, phasic changes of the reticulocyte count, poikilocytosis, polychromatophilia, hemosiderosis, and formation of antierythrocyte autoantibodies were observed. Histological investigations revealed granular dystrophy of the hepatocytes, granular dystrophy and fatty degeneration with basophilic sarcoplasma in the myocardium, dystelectasis with emphysematous alterations and eosinophilic protein deposits in the alveolar lumina and interalveolar lymphoid infiltration, edema of the bronchial walls, hyperemia of the parenchyma with moderate hemosiderosis in the spleen, dystrophy of the epithelium of the convoluted tubules, edema of the stroma, pericapillary hemorrhages and infarction in the kidneys. None of the above functional and morphological alterations was found in animals fed 1.5 mg/kg fenuron for 10 months.

75-1172. Glukhova, L. G. (Dep. Pharmacol., Ternopol Med. Inst., Ternopol, USSR). **Vliyaniye polikhlorpinena na zhelcheobrazovatel'nuyu funktsiyu pecheni. [Action of polychloropinene on the biligenic function of the liver.]** *Farmakol. Toksikol. (Moscow) 37(6): 699-701; 1974.* (9 references) (Russian)

The effect of polychloropinene on the bile-secreting function of the liver and on the bile acid content in the bile was studied in male rats given 1/2, 1/10, or 1/50 LD50 doses of this pesticide once or on 5, 8-10, 17, 30, 75, or 105 consecutive days. While the lowest doses proved to be ineffective, a dose of 1/2 LD50 reduced the secretory activity of the liver from 3.9-4.3 to 0.5-0.8 mg/min/100. Smaller doses caused commensurately weaker inhibition of the bile-secreting activity. Polychloropinene caused a very sharp reduction in the bile acid concentration in the bile, especially when administered in large doses. The cholate formation was inhibited during the phase of the synthesis of primary bile acids from cholesterol, and of the conjugation of choleic acid with taurine and glycine. Polychloropinene inhibited the cholesterol excretion and interfered with the stabilizing action of the bile.

75-1173. Van Osten, G. K.; Gibson, J. E. (Dep. Pharmacol., Michigan State Univ., East Lansing, MI 48824). **Effect of paraquat on the biosynthesis of deoxyribonucleic acid, ribonucleic acid and protein in the rat.** *Food Cosmet. Toxicol. 13(1): 47-54; 1975.* (34 references)

This study was designed to determine the relative subcellular distribution of paraquat and the effect of paraquat on the biosynthesis of DNA, RNA, and protein in rat lung, liver, and kidney. Biochemical parameters were correlated with the clinical syndrome. Paraquat was found in all the major cellular fractions at various times after administration of 126 mg/kg by gavage and no evidence of significant accumulation in any subcellular fraction was present. *L*-Leucine incorporation into protein was increased ($P < 0.05$) in the lung, liver, and kidney 32 hr after paraquat administration and in the lung, protein synthesis was still increased at 128 hr ($P < 0.05$). DNA biosynthesis was significantly decreased in the three organs 32 hr after paraquat treatment. In the kidney, this reduction was also significant at 64 hr. The rate of RNA synthesis was significantly decreased at 16 hr in the liver and kidney. The biochemical changes correlated in time with the histopathological changes induced by paraquat and preceded clinical signs of toxicity by 1-2 days. (Author abstract by permission)

75-1174. Kennedy, G. L., Jr.; Arnold, D. W.; Keplinger, M. L. (Ind. BIO-TEST Lab., Inc. Northbrook, IL 60062). **Mutagenicity studies with captan, captafol, folpet and thalidomide.** *Food Cosmet. Toxicol. 13(1): 55-61; 1975.* (18 references)

The three fungicides, captan, captafol, and folpet and a structurally related compound, thalidomide, were investigated for possible mutagenic activity by the dominant lethal mutagenicity study in mice and by the host-mediated assay in rats using a histidine auxotroph of *Salmonella typhimurium*. Male mice were treated with a single i.p. injection of captan (3 or 6 mg/kg), captofol (1.5 or 3.0 mg/kg), folpet (5 or 10 mg/kg) or thalidomide (500 or 1000 mg/kg). The results of weekly matings with untreated virgin females disclosed no increase in early embryonic death among conceptuses obtained from females mated with the treated males. Groups of male rats were treated by oral intubation for 14 days with one of the three fungicides at levels of 125 or 250 mg/kg/day or with thalidomide at 500 or 1000 mg/kg/day. Indicator micro-organisms recovered from the peritoneal cavity of the treated male rats after a 3-hr residence showed no increase in numbers of revertants. Thus captan, captofol, folpet, and thalidomide were not mutagenic in either of these test systems. (Author abstract by permission)

75-1175. Vijayan, V. K.; Brownson, R. H. (Dep. Human Anat., Sch. Med., Univ. California, Davis, CA 95616). **Polyacrylamide gel electrophoresis of rat brain acetylcholinesterase: isoenzyme changes following parathion poisoning.** *J. Neurochem. 24(1): 105-110; 1975.* (38 references)

Parathion (2.5 or 1.25 mg/kg, i.p.) inhibited the activities of the brain acetylcholinesterase isoenzymes of 15- and 30-day old male and female Sprague-Dawley rats. The degree of inhibition was the same in both age groups following the 2.5 mg/kg dose; the degree of depression of the isoenzymes was independent of sex in both age groups. There were no significant differences in the degree of isoenzyme inhibition, although at 1.25 mg/kg a differential isoenzyme inhibition was evident; the major isoenzyme (isoenzyme 3) exhibited the greatest sensitivity to the inhibitor in all regions of the brain. The course of isoenzyme depression and recovery following parathion administration differed in brain, serum, and skeletal muscle. While the brain isoenzymes exhibited the greatest inhibition 2 hours after parathion injection, the inhibition of the serum and muscle isoenzymes was more prolonged. Four hours after injection, these isoenzymes were still inhibited, while those in the brain had recovered to a substantial degree. After 24 hours, the brain and serum acetylcholinesterase isoenzymes had returned to control activity levels, while those of the skeletal muscle demonstrated only minimal recovery.

75-1176. Russell, R. W.; Overstreet, D. H.*; Cotman, C. W.; Carson, V. G.; Churchill, L.; Dalglish, F. W.; Vasquez, B. J. (Sch. Biol. Sci., Flinders Univ., Bedford Park, Australia). **Experimental tests of hypotheses about neurochemical mechanisms underlying behavioral tolerance to the anticholinesterase, diisopropyl fluorophosphate.** *J. Pharmacol. Exp. Ther. 192(1): 73-85; 1975.* (74 references)

Neurochemical and psychopharmacological techniques were used to study the development of behavioral tolerance to the anticholinesterase, diisopropyl fluorophosphate (DFP) in male Sprague-Dawley rats. Nonspecific metabolic changes are unlikely mechanisms of behavioral tolerance since the activity of adenosine triphosphatase, alkaline phosphatase, and cytochrome oxidase did not change concomitantly with behavioral measures during chronic DFP treatment. Similarly, a lack of change in choline acetylase activity coupled with consistently high acetylcholine levels (140%) and low cholinesterase activity (28.5%) tends to eliminate end-product inhibition of acetylcholine synthesis as a primary mechanism. α-Methyl-*p*-tyrosine (150 mg/kg) affected the behavior of control and DFP-treated rats to a comparable degree, thereby refuting the hypothesis that a redundant adrenergic system may replace the cholinergic system during the development of tolerance to DFP. A decreased sensitivity to cholinergic (muscarinic) receptors is supported as a potential mechanism underlying the development of tolerance by the finding that pilocarpine was less effective in suppressing the responding of DFP-tolerant rats than in repressing that of controls.

75-1177. Curtis, R. F.; Dennis, C.; Gee, J. M.; Gee, M. G.; Griffiths, N. M.; Land, D. G.; Peel, J. L; Robinson, D. (Agric. Res. Council, Food Res. Inst., Norwich, England). **Chloroanisoles as a cause of musty taint in chickens and their microbiological formation from chlorophenols in broiler house litters.** *J. Sci. Food Agric. 25(7): 811-828; 1974.* (32 references)

Following an outbreak of musty taint in the broiler industry in the U.K., samples of birds, litter, earth, dust, feed, and water from commercial broiler sites in Yorkshire, Lancashire, Hertfordshire, and Sussex were analyzed. The cause and origin of the musty taint in the chickens was established as 2,3,4,6-tetrachloroanisole formed by the microbial methylation of 2,3,4,6-tetrachlorophenol. The latter was present as a derivative of the wood preservative, pentachlorophenol (PCP), on the shavings used as litter in the broiler houses. At least three of the fungi found in poultry litter (*Scopulariopsis brevicaulis, Aspergillus sydowi*, and *Pennicillium crustosum*) can effect this methylation. 2,3,4,6-Tetrachloroanisole formed in the litter was taken up by the chickens, possibly via the lungs and/or skin. It is likely that birds growing on litter containing more than about 5μg/g of 2,3,4,6-tetrachlorophenol at the time of slaughter will be tainted. The use of straw as litter might help control the problem, as might the use of pentachlorophenol rather than TCA in the treatment of timber.

75-1178. Matsushima, S.; Abe, E. (Jap. Inst. Rural Med. Usuda, Nagano, Japan). **[The effectiveness and limitations of simian animals in toxicity experiments.]** *Jikken Dobutsu (Exp. Anim.) 23(4): 272-273; 1974.* (Japanese)

Experiences in pesticide toxicity experiments performed on 132 monkeys since 1966 revealed the following advantages of simians: a relatively low mortality rate (14/132); higher susceptibility to pesticides than rodents, rather like mankind; human-like behavior of serum and erythrocyte ChE; more fully developed cerebral cortex; human-like situation of eyes, etc. Their disadvantages were: greater difficulty of obtaining large numbers of specimens; high chance of having intestinal parasites when obtained; non-uniformity of hereditary constitution; difficulty in administration of pesticide for long-term experiments; large fluctuation of individual values in examination; and difficulty in determining the refraction and corneal radius of curvature because of the difficulty of fixing the visual line, etc.

75-1179. Owens, I. S.; Nebert, D. W. (Sect. Developmental Pharmacol., Neonatal Pediatric Med. Branch, Nat. Inst. Child Health Human Develop., Bethesda, MD 20014). **Aryl hydrocarbon hydroxylase induction in mammalian liver-derived cell cultures: stimulation of "cytochrome $P_1$450-associated" enzyme activity by many inducing compounds.** *Mol. Pharmacol. 11(1): 94-104; 1975.* (41 references)

Increases in aryl hydrocarbon (benzo(*a*)pyrene) hydroxylase activity are found in fetal rat liver primary cultures and in cell lines derived from rat Reuber Hepatoma H-35 or mouse Hepatoma BW 7756 when the cells are treated with any of a number of hydrophobic compounds in the growth medium. Effective inducers include: α-naphthoflavone; β-naphthoflavone; 2,5-diphenyloxazole; 2-(4′-chlorophenyl)benzothiazole; 2-(4′-formylphenyl)benzothiazole 1-(2-isopropylphenyl)imidazole, 2-diethylaminoethyl-2,2-diphenyl valerate HCl, piperonyl butoxide, and aminopyrine. The findings indicate that cytochrome $P_1$450 is induced by some factor in the control medium or by phenobarbital in culture, whereas other P450 species predominate in the control or phenobarbital-treated adult intact animal. Caution is suggested in extrapolating certain results found in cultured cells to the actual situation existing in the intact animal.

75-1180. Beattie, K. L. (Dep. Internal Med., Yale Univ. Sch. Med., New Haven, CT 06510). ***N*-nitrosocarbaryl-induced mutagenesis in *Haemophilus influenzae* strains deficient in repair and recombination.** *Mutat. Res. 27(2): 201-217; 1975.* (57 references)

Mutagenesis was studied in repair- and recombination-deficient strains of *Haemophilus influenzae* after treatment with *N*-nitrosocarbaryl (NC). The recombination-deficient mutant *recI* is apparently deficient in the replication-dependent mode of NC-induced mutation fixation, as indicated by the following results: NC-induced mutagenesis is lower in the *recI* strain than in *rec*$^+$ cells; repair of premutational lesions was not detected in the *recI* strain; all of the final mutation yield could be accounted for in the *recI* strain by nonreplicative mutation fixation whereas this could account for only 1/4 to 1/3 of the final mutation yield in the *rec*$^+$ strain; and in the *recI* strain, replication dependent mutation fixation occurs at early times, but the newly fixed mutations disappear at later times leaving only the mutations fixed by the nonreplicative process. The *recI* strain exhibits normal repair of NC-induced single-strand breaks of alkali-labile bonds in the DNA labeled before treatment, but is slow in joining discontinuities present in DNA synthesized after treatment. The results support the idea that in NC-treated *H. influenzae* cells, the replication-dependent mode of mutation fixation occurs by error-prone joining of interruptions present in the DNA synthesized after treatment.

75-1181. Brooks, G. T. (Agr. Res. Council, Unit Invertebrate Chem. Physiol., Univ. Sussex, Brighton, England). **Insect epoxide hydrase inhibition by juvenile hormone analogues and metabolic inhibitors.** *Nature (London) 245(5425): 382-384; 1973.* (16 references)

Synthetic cecropia hormone (mixed isomers), as well as methyl epoxyfarnesoate (MEF) and the synthetic mimics EPGE and EGSE, are competitive inhibitors of cyclodiene epoxide hydrase in pupal homogenates of *Calliphora erythrocephala* and *Tenebrio molitor*, indicating that these compounds are possible alternative substrates for HEOM-hydrase. Juvenile hormone analogues may either mimic the action of the natural hormone at the sensitive site(s) or merely stabilize the levels of endogenous hormone at time points when such levels will be damaging. Sample epoxides seem to be the best inhibitors of HEOM-hydrase. Enzymatic epoxide ring hydration is optimal at alkaline pH. Simple inhibitors of microsomal oxidases, epoxide hydrases, and carboxyesterases may possibly be used as synergists for either biodegradable organochlorine compounds such as HEOM, or labile hormone analogues.

75-1182. Walsh, F.; Mitchell, R. (Lab. Applied Microbiol., Div. Eng. Applied Physics, Harvard Univ., Cambridge, MA 02138). **Inhibition of inter-microbial predation by chlorinated hydrocarbons.** *Nature (London) 249(5458): 673-674; 1974.* (6 references)

The rate of kill of *Escherichia coli* by marine predators in the presence of 2,4-D and *O,O*-dichlorobiphenyl was studied. The predator culture consisted of at least two distinct species of *Spirillum* and one motile pseudomonad. The dominant predator species (*Spirillum*) was necessary for *E. coli* lysis; the lysis mechanism is based on the maintenance of a critical concentration of lytic enzymes. The rate of kill was decreased in shaken test flasks containing the chlori-

nated hydrocarbons and the percentage kill was no longer directly related to the initial predator population. In the standing flasks, the percentage kill decreased in the presence of $10^{-4}M$ 2,4-D or $10^{-5}M$ *O,O*-dichlorobiphenyl. In the presence of $7\times10^{-3}M$ 2,4-D or $10^{-3}M$ *O,O*-dichlorobiphenyl the percentage kill was increased in flasks in which the initial predator population was less than 10^{7}/ml. The hydrocarbons did not affect the viability of the predators of *E. coli*, nor did they affect the activity of the predators. The observed changes in *E. coli* kill rates were probably the results of inhibition or excitation of the chemotactic response in the marine predators.

75-1183. Gehrs, C. W.; Eyman, L. D.; Jolley, R. J.; Thompson, J. E. (Environ. Sci. Div., Oak Ridge Nat. Lab., Oak Ridge, TN 37830). **Effects of stable chlorine-containing organics on aquatic environments.** *Nature (London) 249(5458): 675-676; 1974.* (10 references)

Gravid carp were collected and spawned artificially in the laboratory. The eggs were fertilized and left undisturbed for 30 minutes before the addition of test solutions containing 4-chlororesorcinol and 5-chlorouracil (water-hardened eggs) or fertilized immediately in the test solutions (nonwater-hardened eggs). The latter were subjected to the toxicants in the hardening stage. The tests were run at 21° and 26°C with chemical concentrations ranging from 0.001 to 10 mg/l. The two chemicals showed similar toxicity for the nonwater-hardened eggs, the lowest concentration significantly lowering hatchability in all but the 26°C 5-chlorouracil test medium. With concentrations of 0.05-1 mg/l there was no significant effect on hatchability. 4-Chlororesorcinol had no toxic effects on the water-hardened eggs at concentrations lower than 0.1 mg/l. 5-Chlorouracil had no toxic effects on water-hardened eggs at 21°C, although hatchability was significantly lowered with concentrations greater than or equal to 5 mg/l at 26°C. Stable chlorine-containing organics should be considered in future tests of chlorine toxicity.

75-1184. Le Patourel, G. N. J.; Wright, D. J. (Dep. Zool. Applied Entomol., Imperial Coll. Field Stn., Ascot, Berkshire, England). **Organophosphorus pesticide metabolism associated with nematodes; the role of bacteria.** *Nematologica 20(1): 104-106; 1974.* (7 references)

The effect of omitting the standard antibiotic mixture from the preincubation washes and the final medium, and of increasing the antibiotic concentrations in the final medium, on the subsequent metabolism of phorate by the nematode *Panagrellus redivivus* was studied. In the absence of antibiotics, the oxidation of phorate was increased and there was significantly less phorate present in the incubation medium. Increasing the antibiotic concentration in the final medium had no significant effect. Phorate hydrolysis was independent of the antibiotic concentration used. The levels of oxidized products in the nematodes did not vary with the antibiotic concentration, although the levels of phorate were reduced in the nematodes present in the medium containing no antibiotic compared with those in the medium containing normal and increased antibiotic concentrations. The greater phorate oxidation in the medium containing no antibiotic was probably due to the presence of Gram positive bacteria, suggesting that the bacteria associated with nematodes may significantly influence the rate of breakdown of phorate and presumably other similar pesticides.

75-1185. Sosnierz, M.; Wazna-Bogunska, C.; Szczurek, Z. (Dep. Anat. Pathol., Acad. Med., Katowice, Poland). **Zmiany neuropatologiczne u szczurow zatruwanych przedziorkofosem. [Neuropathological changes in the rat brain after przedziorkorfos intoxication.]** *Neuropatol. Pol. 11(1): 109-115; 1973.* (5 references) (Polish)

Rats were given various doses of przedziorkorfos (phencapton) for 14 days or 3 months and sacrificed at various intervals after treatment. Brain sections, stained with hematoxylin-eosin and cresyl violet, were examined under the optical microscope. Phencapton poisoning essentially caused degeneration of nerve cells in the rat brain. The neurons of the cerebral cortex, brainstem, and cerebellum were particularly susceptible to the drug action. The neuronal damage and nerve cell destruction were seen not only at large doses of high systemic toxicity, but also at low doses which do not cause pathological changes in other organs.

75-1186. Kataoka, S. (Sch. Legal Med., Fac. Med., Kumamoto Univ., Kumamoto, Japan). **[Studies on the influence of organic synthetic pesticides on tissue respiration and glucose metabolism in rat brain. Preface and Part 1, tissue respiration.]** *Nippon Hoigaku Zasshi (Jpn. J. Legal Med.) 28(1): 24-30; 1974.* (Japanese)

The influence of six kinds of synthetic organic pesticides, ethylmercuric phosphate, phenylmercuric acetate, parathion, malathion, monofluoroacetamide, and sodium monofluoroacetate, on the cerebral tissue respiration was studied in vitro and in vivo using male Wistar rats. Cerebral cortex slices were immersed into the diluted pesticide, or the pesticides were administered orally at respective doses of 2, 8, 2, 5, 7, and 2 times the LD50 of the pesticides mentioned. After killing the respective rats their cerebral cortex slices were prepared. The respiration was determined via the consumption of oxygen for 60 min in a Warburg apparatus. In vitro both organomercury pesticides showed suppressive action, more markedly for the alkyl mercury than the aryl mercury compounds; both organophosphorus pesticides also showed suppressive action, with a small difference between them; and the organofluorine pesticides showed no marked suppressive action. The results in vivo were: both mercurials showed accentuative action, both organophosphates showed suppressive action, and both

fluorine compounds showed suppressive action, more marked for sodium monofluoroacetate than for monofluoroacetamide.

75-1187. Kataoka, S. (Sch. Legal Med., Fac. Med., Kumamoto Univ., Kumamoto, Japan). **[Studies on the influence of synthetic organic pesticides on tissue respiration and glucose metabolism in rat brain. Part 2. Glucose metabolism.]** *Nippon Hoigaku Zasshi (Jpn. J. Legal Med.) 28(1): 30-36; 1974.* (51 references) (Japanese)

The effects of the synthetic organic pesticides ethylmercuric phosphate, phenylmercuric acetate, parathion, malathion, monofluoroacetamide, and sodium monofluoroacetate on glucose comsumption and lactic acid formation were studied. In vitro, Wistar rat cerebral cortex slides were immersed in solutions of the respective pesticides under aerobic conditions. For in vivo tests the respective pesticides were administered orally to Wistar rats. The rats were killed and cerebral cortex slides prepared, then the glucose consumption and lactic acid formation were determined under aerobic conditions. The organomercury pesticides suppressed glucose consumption and lactic acid formation at higher concentrations in vitro; however, they showed a tendency in vivo to enhance glucose consumption and lactic acid formation. The organophosphorus pesticides generally suppressed the glucose consumption aside from a transient accentuation at lower concentration, and accentuated lactic acid formation except for suppression at higher concentrations in vitro. Both suppressed glucose consumption but did not affect lactic acid formation in vitro, and suppressed glucose consumption and accentuated lactic acid formation in vivo.

75-1188. Matsumoto, K. (Sch. Legal Med., Fac. Med., Kumamoto Univ., Kumamoto, Japan). **[Studies on changes of pupil diameter in intoxication by organophosphorus pesticides.]** *Nippon Hoigaku Zasshi (Jpn. J. Legal Med.) 28(1): 43-58; 1974.* (13 references) (Japanese)

The time course of changes in pupil diameter was observed in rabbits killed by oral administration of the highly toxic organophosphorus (OP) pesticides TEPP, parathion, and methyl parathion; the moderately toxic OPs diazinon, dichlorvos, and fenthion; and the low toxicity OPs trichlorfon, malathion, and fenitrothion at dose rates of 5 times and 10 times the respective LD50 (p.o. for mouse). The post-mortem miosis approximately paralleled the toxicity of the OP: the higher the toxicity, the more marked the miosis. The pupils of the cadavers of OP-poisoned rabbits showed a tendency to progress from post-mortem miosis to mydriasis, and in almost all cases mydriasis attained its peak 24 hr after death. Up to 6 hr after death the degree of miosis was larger with the larger dose than with the smaller dose. In additional experiments, alcohol, brovalin, or PAM (pralidoxime) was administered before sufficient OP was given to kill the rabbits. Alcohol decreased the degree of postmortem miosis by TEPP; brovarin also decreased the degree of miosis by TEPP, diazinon, and malathion PAM markedly decreased the miosis by TEPP, diazinon and malathion.

75-1189. Takahashi, M.; Inokuchi, K.; Kasakawa, H.; Wakai; S.; Kimura, M. (Sch. Pharmacol., Fac. Med., Hirosaki Univ., Hirosaki, Aomori, Japan.) **[Experimental studies on the effects on rabbits of pesticide (zinc ethylenebis-dithiocarbamate and *N*-trichloromethyl-tetrahydrophthalimide) spraying in vinyl greenhouses.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.) 23(4): 522-528; 1974.* (17 references) (Japanese)

Farmers working in vinyl greenhouses are exposed to the effects of fungicides. Subacute toxicity tests were carried out on male rabbits exposed in the greenhouse for 3 months respectively to zineb and captafol, which had been sprayed once or twice a week at the usual dose rate. Neither zineb nor captafol inhibited the growth of the rabbits. No significant alteration attributable to either pesticide was shown in blood, urine, or biochemical examinations. In the interalveolar tissue of the lungs of the animals exposed to captafol, infiltrations of polymorphonuclear leukocytes and histiocytes were recognized, but these symptoms were so slight in the animals exposed to zineb that they did not differ from controls. No abnormality was found in the brain, heart, kidney, spleen, stomach, or intestines. Inflammation was observed in the eyes and skins of some animals exposed to captafol, whereas no such symptoms were found on those exposed to zineb. The concentrations of zineb and captafol were, respectively, 0.35 and 0.20 mg/m^3 at the time of spraying; however, after one hour both pesticides became undetectable.

75-1190. Kawai, M.; Naito, M. (Sch. Hyg., Tokyo Dental College, Tokyo, Japan). **Experimental studies on ocular disturbances due to organophosphorus pesticide.** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.) 23(4): 543-544; 1974.* (Japanese)

In order to examine the mechanism of ocular disturbances in rats due to organophosphorus pesticides, several such pesticides were administered and several actions such as eyelid closing, lagophthalmos, and cutting of the sympathetic ganglion in the neck were conducted. However, this did not aid in the elucidation of the mechanism. Rabbits were sprayed with 10-500 fold dilutions of 50% fenitrothion EC in water 30 min-2 hr/day for 30 continuous weeks. The plasma cholinesterase activity decreased by about 40% after spraying at high concentration and by about 20-30% after spraying at lower concentration. The erythrocyte cholinesterase activity decreased by about 10-20% after spraying at the lower concentration. No abnormal change was recognized on external ocular parts and pupils. However, in the group sprayed with higher con-

centrations of fenitrothion, a decrease in the radius of curvature of the cornea was recognized.

75-1191. Moroi, K.; Ushiyama, S.; Sato, T.; Kuga, T. (Inst. Biol. Activ., Chiba Univ., Chiba, Japan). **[Studies on the inductive effect of 2-chloro-1-(2,4,5-trichlorophenyl)vinyl dimethyl phosphate.]** *Nippon Yakurigaku Zasshi (Jpn. J. Pharmacol.) 70(6): 233; 1974.* (Japanese)

A study was carried out to elucidate the relatively low mammalian toxicity of 2-chloro-1-(2′,4′,5′-trichlorophenyl)vinyl dimethyl phosphate (TCVP, tetrachlorvinphos) as compared to that of dichlorvos. The *pI*50 value of TCVP was 5.5 (7.2 for dichlorvos); the pseudo-ChE inhibitory activity was 1/100 of that of dichlorvos. The dose-response curve of TCVP between 30-1000 mg/kg in the Wistar male rat showed parallelism between the response and the dose. The inhibitory patterns for pseudo- and true ChE were different. The time course of ChE inhibition in brain, erythrocyte, and serum showed a maximum 4-6 hr after administration, then slow restoration. When TCVP was orally administered at 250 mg/kg/day for 10 days, ChE activity was depressed at the first day; however, the depression did not increase thereafter, and an increase in the activity of detoxifying enzymes in the liver accompanied the administration. Prior administration of phenobarbital at 80 mg/kg for 3 days decreased the ChE inhibitory action of TCVP. It was presumed that TCVP was metabolized by liver microsomal detoxifying enzymes, and that TCVP itself induced the enzyme and in turn its toxicity was decreased.

75-1192. Casida, J. E.; Kimmel, E. C.; Ohkawa, H.; Ohkawa, R. (Div. Entomol. Parasitol., Univ. California, Berkeley, CA 94720). **Sulfoxidation of thiocarbamate herbicides and metabolism of thiocarbamate sulfoxides in living mice and liver enzyme systems.** *Pestic. Biochem. Physiol. 5(1): 1-11; 1975.* (11 references)

The microsome-NADPH system of mouse liver oxidizes benthiocarb, butylate, cycloate, EPTC, molinate, pebulate, and vernolate herbicides to the corresponding thiocarbamate sulfoxides. The sulfoxide is then cleaved by the liver soluble-glutathione system. These sulfoxides can be detected as transient metabolites in the liver of mice injected with EPTC, molinate, pebulate, and vernolate, but not with the other three thiocarbamates. Thiocarbamate sulfones are not detected as metabolites of the thiocarbamates. In vivo and in vitro studies with [^{14}C]EPTC and -pebulate or their corresponding sulfoxides and/or sulfones indicate that sulfoxidation is the initial metabolic step in cleavage of the thiocarbamate ester group. Sulfoxidation appears to be a detoxification mechanism for thiocarbamate herbicides in mammals. Thiocarbamate sulfoxides are more potent and more selective herbicides under laboratory and greenhouse conditions than the corresponding thiocarbamates. However, these sulfoxides are not likely to persist in mammals or under environmental conditions.

75-1193. Skalsky, H. L.; Guthrie, F. E. (Dep. Entomol., North Carolina State Univ., Raleigh, NC 27607). **Binding of insecticides to macromolecules in the blood of the rat and American cockroach.** *Pestic. Biochem. Physiol. 5(1): 27-34; 1975.* (22 references)

The isolation and identification of specific carrier proteins for DDT, dieldrin, and parathion insecticides in mammalian and insect blood, in vivo and in vitro, were investigated using male Wistar rats and *Periplaneta americana* (L). The amount of pesticide transported by the red blood cell in the rat (about 18%) appeared low when compared to previously reported values. Variable factors range from species of animal to dose level and type of administration. In this study, less than 2% of the insecticide was carried in the cellular component, which again differs from results in the literature. In this investigation two distinct groups of proteins that bind dieldrin in the roach were revealed. One had a high molecular weight and the other a comparatively low molecular weight. The high-molecular weight fraction contained a variety of lipoproteins that bind both DDT and dieldrin. The lipoprotein which migrates as a single electrophoretic band has an approximate molecular weight of 520,000. To determine whether these lipoproteins are important in intoxication, the DDT-binding complex from the nerve tissue of roaches was compared to the DDT-binding protein of the hemolymph by comparing the extent of binding of DDT to hemolymph and nerve complexes. It appears that the lipoproteins of the roach hemolymph bind DDT much more strongly than does the nerve complex reported earlier. This suggests that DDT would not be directly transferred from these lipoproteins to the nerve. Perhaps these macromolecules are significant only in the storage and translocation of DDT.

75-1194. Hirwe, A. S.; Metcalf, R. L.*; Lu, P. Y.; Chio, L. C. (Dept. Entomol., Univ. Illinois, Urbana-Champaign, IL 61801). **Comparative metabolism of 1,1-bis(*p*-chlorophenyl)-2-nitropropane (prolan) in mouse, insects, and in a model ecosystem.** *Pestic. Biochem. Physiol. 5(1): 65-72; 1975.* (16 references)

The substitution of the nitropropane group for the trichloromethyl group of DDT has produced a compound, prolan, which is more environmentally degradable than DDT and which does not serve as a precursor of a pernicious environmental micropollutant like the DDT derived compounds. However, prolan is stored in the tissues of the snail, mosquito larva, and daphnia to relatively high ecological magnification levels and has a relatively low biodegradability index in these species. Still, the insecticide was degraded in the systems studied by elimination to 1,1-bis-(*p*-chlorophenyl)-1-propene, and by reduction to 1,1-bis-(*p*-chlorophenyl)-2-

aminopropane. However, the major degradative pathway was by oxidation to 1,1-bis-(*p*-chlorophenyl)-2-propanone, to 1,1-bis-(*p*-chlorophenyl)-pyruvic acid, to bis-(*p*-chlorophenyl)-acetic acid, and ultimately to *p,p'*-dichlorobenzophenone. Therefore the ultimate degradative products of prolan are identical to those produced from DDT. The widespread use of prolan as a DDT substitute is not seen as offering a great improvement in environmental quality.

75-1195. Frear, D. S.; Swanson, H. R. (Metab. Radiat. Res. Lab., Fargo, ND 58102). **Metabolism of cisanilide (cis-2,5-dimethyl-1-pyrrolidinecarboxanilide) by excised leaves and cell suspension cultures of carrot and cotton.** *Pestic. Biochem. Physiol. 5(1): 73-80; 1975.* (12 references)

Major methanol-soluble metabolites of cisanilide were isolated from excised, pulse-treated carrot and cotton leaves. They were identified as *O*-glucoside conjugates of primary aryl and alkyl oxidation products, 2,5-dimethyl-3-hydroxy-1-pyrrolidinecarboxanilide. Comparative studies using cotton and carrot cell cultures showed similar initial pathways of cisanilide metabolism. Time-course studies with [^{14}C-pyrrolidine]- and [^{14}C-phenyl] cisanilide showed little, if any, cleavage of the herbicide molecule in either excised leaves or cell cultures. Quantitative differences in the metabolism of cisanilide by cell cultures and excised leaves included a reduced capacity of cell cultures to form secondary glycoside conjugates and an increased ability of cell cultures to form methanol-insoluble residues. Preliminary studies indicate that this residue is a carbohydrate-protein complex associated with the cell wall surface. The comparison of cisanilide metabolism in excised leaves and cell suspension cultures suggests that cell cultures are less able to conjugate primary oxidaton products.

75-1196. Strzelec, A. (Inst. Agric. Fertil. Soil Sci., Pulawy, Poland). **Mikrobiologiczny rozklad *s*-triazynowych herbicydow w glebie. [Microbial degradation of *s*-triazine herbicides in soil.]** *Postepy Nauk Roln. 21(2): 23-39; 1974.* (120 references) (Polish)

An extensive review is given on the microbial degradation of *s*-triazine herbicides in soil. It is stressed that the rate of herbicide disappearance is influenced by 1) microbial degradation; 2) chemical degradation as a result of photochemical reactions, hydrolysis, or oxidation; 3) adsorption on surfaces of organic and mineral soil particles; and 4) adsorption and degradation by plants. A positive correlation between rate of degradation and environmental conditions conducive to microbial growth has been demonstrated. A variety of microorganisms can use *s*-triazine as a source of either carbon (from side chains) or nitrogen (in the presence of an energy source). It has been found that molds are more active than other microorganisms (especially in the case of simazine degradation by *Aspergillus fumigatus* and atrazine by *A. terreus*). The ability to degrade herbicides is ascribed to mutation, enzyme induction, or enzyme adaptation. A variety of microorganisms contain enzymes capable of degrading chloro-*s*-triazine compounds, but degradation of methyl-*s*-triazine is due to enzyme adaptation. The degree of degradation is strongly influenced by the chemical structure of the compound and type of organism used. In studies using *A. fumigatus* with methoxy, methylthio, and chloro analogues of simazine, atrazine, and propazine it was shown that the least use was made of methoxy-*s*-triazines. *Pseudomonas* species more readily utilized compounds containing diethylamine groups, while *Arthrobacter* species made better use of compounds with ethylamine groups. The isopropylamines were utilized to the same degree by both species. The degradation of *s*-triazines is affected by a variety of mechanisms, some resulting in complete detoxification, others in activation and increased toxicity of metabolites. Hydroxylation of chloro-*s*-triazines is regarded as the initial reaction in microbial degradation of these compounds. The degradation of simazine takes place through dealkylation, deamination, or both. The degradation of chloro-*s*-triazine occurs through hydroxylation and dealkylation. The mechanisms of biodegradation of methoxy-*s*-triazines and of methyl-tri-*s*-triazines are discussed at length.

75-1197. Scott, R. D. M. (Dep. Med., Western Gen. Hosp., Edinburgh, Scotland). **Treatment of an adrenal cortical carcinoma with a combination of *o,p'*-DDT and aminoglutethimide.** *Postgrad. Med. J. 51(591): 35-37; 1975.* (15 references)

A 44-year-old man with Cushing's syndrome was diagnosed at operation as having an adrenal carcinoma invading the left renal pedicle. Left adrenalectomy and nephrectomy were performed with partial removal of the involved paraaortic lymph nodes. Treatment of the residual disease and functional metastases was attempted with *o,p'*-DDT and later with aminoglutethimide. Steroid excretion was markedly reduced within 2 weeks after the beginning of DDT treatment. The drug was withdrawn due to intolerable side effects (nausea, vomiting, and diarrhea), after which steroid excretion showed a progressive rise. Reintroduction of DDT at a tolerable dose had little effect on steroid levels but enabled the patient to return to light work for 10 months. Aminoglutethimide, although well tolerated, had little effect on steroid excretion. The early introduction of *o,p'*-DDT in combination with aminoglutethimide should be considered for the treatment of patients with inoperable or metastatic adrenal carcinoma when corticosteroid production is increased.

75-1198. Allen, J. G.; Seawright, A. A. (Vet. Sch., Univ. Queensland, Brisbane, Australia). **The effect of prior**

treatment with phenobarbitone, dicophane (DDT) and β-diethylaminoethyl phenylpropyl acetate (SKF 525A) on experimental intoxication of sheep with the plant *Myoporum deserti* Cunn. *Res. Vet. Sci. 15(2): 167-179; 1973.* (26 references)

Single oral doses (2.25 or 5 g/kg) of powdered leaf of *Myoporum deserti*, the main toxic principle of which is dehydrongaione, caused death in sheep within 1-3 days. If SKF 525A was given to the animals before dosing with 1 g/kg of toxic leaf, the toxicity was significantly reduced compared with controls, suggesting that the hepatotoxic oils required metabolism by the hepatic microsomal drug metabolizing enzymes to produce toxicity. Pretreatment with phenobarbitone or DDT compounds, which enhanced the activity of these enzymes, did not significantly increase the toxicity of the plant. The zonal distribution of the liver lesions in the control sheep was primarily periportal, although midzonal and centrilobular lesions were sometimes found. Periportal necrosis was consistently found in phenobarbitone and DDT-treated animals while in the SKF 525A-treated animals, the injury was centrilobular. Thus, the level of the hepatic drug-metabolizing enzymes at the time of poisoning appeared to be involved in determining the toxicity of the plant for the animal and in the zonal distribution of injured cells in the liver. The findings are similar to those previously reported for the effects of these drugs on ngaione toxicity in the mouse.

75-1199. Luczak, J.; Maleszewska, J.; Stanislawska, J.; Zycinski, D. (Dept. Munic. Hyg., Nat. Inst. Hyg., Warsaw, Poland). **Wplyw pestycydow fosforoorganicznych (malation, foschlor, dichlorfos) na wlasciwosci fizyczno-chemiczne wody i organizmy wodne. [Effects of organophosphorus pesticides (malathion, foschlor, dichlorvos) on physico-chemical properties of water and on water organisms.]** *Rocz. Panstw. Zakl. Hig. 24(2): 137-150; 1973.* (14 references) (Polish)

The effects of chemically pure malathion, foschlor (trichlorfon), and dichlorvos, and liquid formulations of these compounds on the organoleptic and physicochemical properties of water and on the development of aquatic organisms were examined. The pure chemicals changed the taste and smell of distilled water to which they were added at concentrations of 5.0-10.5 mg/l, whereas the formulations were detectable at concentrations 10-100 times lower. The formulations also foamed. Chemically pure foschlor at concentrations above 2 mg/l significantly depressed nitrification and oxygen exchange processes in the water and affected algal growth. Chemically pure dichlorvos at concentrations above 4 mg/l had a significant stimulating effect on the growth of nitrate-reducing bacteria. The formulations of malathion and trichlorfon significantly affected nitrification processes and oxygen exchange, stimulated the growth of the bacterias studied, and reduced the number of plankton organisms. The disappearance of the organophosphate pesticides from water was correlated with quantitative changes in aquatic organisms, which may suggest participation of biochemical processes in the decomposition of these substances.

75-1200. Syrowatka, T.; Jurek, A. (Dept. Toxicol. Sanit., State Inst. Hyg., Warsaw, Poland). **Rakotworczosc pestycydow. [Carcinogenicity of pesticides.]** *Rocz. Panstw. Zakl. Hig. 25(6): 563-567; 1974.* (12 references) (Polish)

A general discussion is presented on the problems encountered in evaluating the possible carcinogenic effect of pesticides. The discussion is based on reports and recommendations issued by the U.S. Commission on Pesticides and other scientific health agencies. The requirements concerning methods of investigation for carcinogenicity are briefly reviewed. Pesticides were classified as belonging to one of four main groups: group A, "non-positive", when data is acceptable according to established criteria of testing and results were negative in at least 2 species of animals; group B, "positive", when data is acceptable and results positive with a probability level of 0.01 in one or more species of animals; group C, when available data is insufficient for definite classification; group C_1, results are significant with a probability level of 0.01 but the compound is less active when compared to the mean value of positive controls; group C_2, significant with probability level of 0.02 but compound less active than mean of positive controls; group C_3, incidence of tumors increased in comparison to controls but statistical significance less than 0.02 because of small number of animals; group C_4, incidence of tumors not increased, but only one species of animals was tested; group D, available data insufficient for any comment on carcinogenicity of the substance. Group B includes aldrin, aramite, chlorobenzilate, *p,p'*-DDT, dieldrin, mirex, strobane, heptachlor, and the following compounds which are registered, but not used in agriculture in Poland: amitrole, avadex (diallate), bis(2-chloroethyl)ether, *N*-(2-hydroxyethyl)hydrazine, and PCNB.

75-1201. Bick, M.; Fishbein, L. (Clin. Res. Cent., Northwick Park Hosp., Harrow, Middlesex, England). **The inductive effect of piperonyl butoxide on microsomal demethylase activity.** *Sci. Total Environ. 1: 197-203; 1972.* (27 references)

Piperonyl butoxide acts as an insecticide synergist. A dose-dependent increase in male Sprague-Dawley rat hepatic microsomal demethylase activities associated with an increase in relative liver weight was found after i.p. injection of piperonyl butoxide for 7 days. The degree of induction was similar to that seen after repeated injections of DDT (30 mg/kg). An increase in microsomal demethylase activities was not observed in preparations made from brain, kidney, lung, or small intestine of animals given repeated injections of piperonyl butoxide or DDT. Inhibition of ethyl-

morphine and aminopyrine demethylase activities was not observed after a single injection of piperonyl butoxide (320 and 640 mg/kg) or of DDT (30 mg/kg). An increase in *p*-nitroanisole demethylase activity similar to that found after DDT injection was found in animals 24 to 48 hr after a single injection of piperonyl butoxide at 640 mg/kg, but not if the dose was 320 mg/kg.

75-1202. Moriyama, I. (Sch. Obstetr. Gynecol., Nara Prefect. Med. Coll., Nara, Japan). **[Congenital anomaly and an environmental factor, chemical substances.]** *Sogo Rinsho (Clin. All-Round) 24(1): 95-102; 1975.* (30 references) (Japanese)

The reasons why the mechanisms of congenital anomaly production by chemical substances have not been elucidated to date are listed, and the factors concerning teratogenesis are enumerated. Primary emphasis was placed on host factors, pharmacodynamics, placental penetration of chemicals, and the limitations of experimental teratology. Pesticides were mentioned among the major chemicals which possibly induce teratogenesis, and 4-chloro-2-methyl phenoxy acetic acid (MCPA), carbaryl, and dithiocarbamates were specifically cited as teratogens.

75-1203. MacRae, I. C.; Celo, J. S. (Dept. Microbiol., Univ. Queensland, Brisbane, Australia). **The effects of organophosphorus pesticides on the respiration of *Azotobacter vinelandii*.** *Soil Biol. Biochem. 6(2): 109-111; 1974.* (7 references)

Polarography was used to study the effects of various organophosphorus pesticides (2 and 100 ppm) on the oxygen uptake of *Azotobacter* with glucose as substrate. Exposure of washed bacterial suspensions to naled, Terracur-P (fensulfothion), coumaphos, DDVP (dichlorvos), malathion, Nemacur-P (phenamiphos), chlorpyrifos, DOWCO 217, or DOWCO 214 (100 ppm) greatly reduced the respiration rate as measured 2 hours later. Respiration was also inhibited by naled, coumaphos, DDVP, chlorpyrifos, and, to a lesser extent, DOWCO 217 and Nemacur-P at 2 ppm. Terracur-P and DOWCO 214 caused no inhibition at 2 ppm. Malathion stimulated respiration at 2 ppm, while diazinon stimulated respiration at both concentrations. Endogenous repiration was stimulated by naled at 2 ppm and by Nemacur-P and DDVP at both concentrations. The effect on respiration was reduced when the bacteria were grown in the presence of 100 ppm DDVP or naled; growth in Terracur-P had no such effect.

75-1204. Van Faassen, H. G. (Inst. Soil Fertility, Haren (Gr.), The Netherlands). **Effect of the fungicide benomyl on some metabolic processes, and on numbers of bacteria and actinomycetes in the soil.** *Soil Biol. Biochem. 6(2): 131-133; 1974.* (7 references)

Humus-rich sandy soils were treated with a spray formulation containing 50% benomyl or with water and were incubated at 15° or 20°C. Benomyl treatment increased the numbers of bacteria in the soil; after 6 and 14 days the microbe numbers increased with increasing fungicide concentration. Benomyl treatment did not influence the numbers of actinomycetes counted after 6, 21, 50, and 80 days. Fungicide treatment caused a shift in the bacterial flora of the soil. The addition of benomyl to liquid or agar media inhibited the outgrowth of some soil bacteria, especially the nitrite oxidizers, in these media. Benomyl, even in high concentrations, had little effect on the evolution of CO_2 from the soil. Fungicide treatment resulted in a significant increase in nitrite-nitrogen after 12 weeks; ammonification was immediately followed by nitrification. In vitro, the oxidation of nitrite to nitrate was more sensitive to benomyl than was the oxidation of ammonium to nitrite. The dehydrogenase activity of the soil was not significantly affected by benomyl treatment.

75-1205. Wainwright, M.; Pugh, G. J. F. (Dept. Botany, Univ. Nottingham, England). **The effects of fungicides on certain chemical and microbial properties of soils.** *Soil Biol. Biochem. 6(4): 263-267; 1974.* (17 references)

Benomyl, captan, dicloran, formalin, quintozene, and thiram were applied at the normal field rate and then again at double the field rate to Rothamsted and Sutton Bonington soils. When applied at the normal rate, the fungicides significantly lowered the concentration of nitrate-nitrogen; formalin, dicloran, and thiram had the greatest effect on nitrification and quintozene had the least effect. The fungicide treatments generally increased the amounts of exchangeable Mn, Na, and Zn; thiram also increased the concentrations of Na and K and benomyl decreased the Cu concentration. The application of fungicides at twice the field rate had a pronounced effect on nitrification and ammonification, and increased the numbers of bacteria and fungi after 28 days. Members of the fungal genera *Gliocladium*, *Penicillium*, and *Trichoderma* predominated. Addition of the fungicides to soil incubated in the laboratory consistently increased exchangeable Mn and K and occasionally increased exchangeable Cu, Na, and Zn.

75-1206. Lopez, C. E.; Kirkwood, J. I. (Sch. Agr., Prairie View A. and M. Coll., Prairie View, TX 77445). **Isolation of microorganisms from a Texas soil capable of degrading urea derivative herbicides.** *Soil Sci. Soc. Am. Proc. 38(2): 309-312; 1974.* (14 references)

Samples of Hockley fine sandy loam were perfused with 500 μg/ml concentrations of monuron or diuron for 2 weeks to isolate microorganisms tolerant to these concentrations. A fungus of the genus *Fusarium* and two unidentified bacteria were isolated by plating out small samples of the treated soil on Czapek's solution agar without sugar with 20 ppm of both herbicides added. The three isolates were tested for their ability to grow in

solid and liquid media with different concentrations of the herbicides as sources of carbon. Cultures of the three isolates in Czapek's solution agar without sugar containing 20 ppm diuron, including 0.5 ppm of carbonyl ^{14}C-diuron, were incubated for 2 weeks. The organisms grew profusely, but no breakdown products of diuron were detected from the extracts of these cultures as analyzed by TLC (thin layer chromatography) and strip scanning techniques. Approximately 3.5% of the added diuron was collected as $^{14}CO_2$ from soil samples incubated for 80 days with carbonyl labeled ^{14}C-diuron and a mixture of the three isolates. Periodic analysis of soil samples from these experiments did not indicate any breakdown products of diuron apparently due to insensitivity of the instrumentation and procedures. However, data from the fungal growth and CO_2 evolution experiments suggests that these organisms can use monuron and diuron as a source of carbon. (Author abstract by permission, abridged)

75-1207. Kolycheva, S. S.; Nadzhimutdinov, K. N.; Murzabekov, Sh. M. (Tashkent State Med. Inst., Tashkent, USSR). **Osobennosti vliyaniya tetrametiltiuramdisul'fida (TMTD) na deystviye geksenala i korazola u zhivotnykh razlichnogo vozrasta. [Peculiarities of the effect of tetramethylthiuram disulfide on the action of hexenal and corazole in animals of various ages.]** *Sov. Zdravookhr. Kirg. 6: 57-59; 1973.* (Russian)

Age-conditioned differences in the effect of 300 mg/kg doses of tetramethylthiuram disulfide (thiram, TMTD) on the action of hexenal (hexobarbital) and corazole (pentylenetetrazole) were studied in rats. The animals were administered hexenal at 110 mg/kg i.p. or corazole at 40 mg/kg s.c. 24 hr after poisoning. Prolongation of the hexenal-induced sleep was observed in all animals, whether young, adult, or old, while this effect was most pronounced in the latter. The prolongation of sleep under the influence of TMTD was due to its inhibiting the activity of hepatic microsomal oxidases. As determined from the duration of corazole-induced spasms, TMTD considerably decreased the toxicity of corazole in adult rats, while increased toxicity of corazole in TMTD-treated young and old animals was observed. The toxicity-increasing effect of TMTD in young and old animals was most probably due to TMTD inhibition of the corazole metabolizing enzymes.

75-1208. Davy, F. B.; Kleerekoper, H. (Texas A and M Univ., College Station, TX). **Interference with a memory process by DDT in goldfish (*Carassius auratus*).** *Tex. J. Sci. 23(4): 574; 1972.*

In a previous study of locomotor behavior in naive goldfish, a positive correlation was established between the magnitude of consecutive turns in opposite directions. This correlation decreased with increasing elapsed time between turns and was attributed to a central nervous system memory process. In the present study, exposure of naive goldfish to 10 ppb DDT resulted in a loss of this memory phenomenon. The effect occurred after only 4 days of continuous exposure to the insecticide. The results indicate that "sublethal" concentrations of DDT affect the central nervous systems of goldfish after short exposure times.

75-1209. Hyde, K. M.; Stokes, S.; Fowler, J. F.; Graves, J. B.; Bonner, F. L. (Dept. Entomol., Louisiana State Univ., Baton Rouge, LA 70803). **The effect of mirex on channel catfish production.** *Trans. Am. Fish. Soc. 103(2): 366-368; 1974.*

Mirex bait (0.3% technical material) was applied in three applications (1.4 kg/ha each over period of 8 months) to four ponds containing fingerling channel catfish (*Ictalurus punctatus* (Rafinesque)). The percent survival, weight, and length of the fish reared in the treated ponds did not differ significantly (0.05 level) from those of fish in untreated ponds; however, the percent survival in the mirex ponds was significantly reduced at the 0.10% level compared with fish in the untreated ponds. After the final pesticide treatment, fillets prepared from fish taken from the treated ponds contained average mirex residues of 0.015 μg/g, and the fat contained average residues of 0.255 μg/g. Based on the fat content of the fillets and assuming that all the mirex was present in the fat, the observed average residue levels in the fillets would be equivalent to 0.49 μg/g in meat fat; this is well above the government established tolerance of 0.1 μg/g in red meat fat.

75-1210. Kynard, B. (Arizona Cooperative Fishery Unit, Univ. Arizona, Tucson AZ 85721). **Avoidance behavior of insecticide susceptible and resistant populations of mosquitofish to four insecticides.** *Trans. Am. Fish. Soc. 103(3): 557-561; 1974.* (14 references)

Mosquitofish, *Gambusia affinis*, from two populations differing greatly in insecticide tolerance were tested for their ability to avoid concentrations of DDT, endrin, toxaphene, and parathion in a Y-maze. The insecticides were initially present in concentrations too small to be detected, followed by succeedingly higher concentrations of insecticides. Mosquitofish from both resistant and susceptible populations avoided endrin, toxaphene, and parathion although the avoidance differed with different insecticides. Susceptible fish weakly avoided DDT, endrin, and toxaphene. Resistant fish weakly avoided endrin and showed no avoidance of DDT. For those insecticides avoided by resistant fish and by susceptible fish, the concentrations were lower for the former group. In each population about the same percentage of individuals responded to the insecticide concentration that was avoided. Thus, it was concluded that even with long-term exposure of susceptible fish to insecticides, the percentage of individuals expressing the avoidance trait might not change, but the level of insecti-

cide concentration at which avoidance was noted would likely change.

75-1211. Pevzner, D. L.; Rozengart, V. I. (I. M. Sechenov Inst. Evolut. Physiol. Biochem., Acad. Med. Sci. USSR, Leningrad, USSR). **Sravnitel'noye issledovaniye svoystv atsetylkholinesterazy eritrotsitov i mozga krolika. [Comparative investigation of acetylcholinesterase in the erythrocytes and brain of the rabbit.]** *Biokhimiya 39(4): 864-868; 1974.* (14 references) (Russian)

Comparative in vitro study of the catalytic activity and inhibition by different organophosphorus compounds of rabbit erythrocyte and nucleus caudatus acetylcholinesterase is presented. Hydrolysis tests on acetylcholine, propionylcholine, and acetyl-β-methylcholine substrates revealed an optimum substrate concentration, i.e., inhibition of hydrolysis by excess substrate, and highest rate of hydrolysis for acetylcholine with both types of acetylcholinesterase. The optimum concentrations of acetylcholine and propionylcholine were identical, and about 10 times lower than that of acetyl-β-methylcholine. The optimum substrate concentration, Michaelis' constant, and the activity of the catalytic center were found to be similar for both types of acetylcholinesterase. However, the acetylcholinesterase content was higher in nucleus caudatus than in the erythrocytes. The rates of inhibition by two pairs of methylphosphonic acid derivatives (Gd-125–Gd-126, and Gd-7–Gd-42 not further identified) were identical for both acetylcholinesterases, while the compounds containing sulfide groups were the most powerful inhibitors. The findings indicate identical sensitivity of erythrocyte and brain acetylcholinesterase within the same animal.

See also **75-1000** **75-1016** **75-1020** **75-1052** **75-1220**

75-1212. Baluja, G.; Franco, J. M.; Murado, M. A. (Inst. Organic Chem., Madrid, Spain). **Interference of phenoxyacetic acid derivatives in the estimation of monochloroacetic acid by the thioindigo method.** *Arch. Environ. Contam. Toxicol. 1(4): 375-380; 1973.* (10 references)

The thioindigo test for the detection of monohalogenoacetic acids and/or derivatives thereof has been adopted for spectrophotometric estimation of residues in wine and other substrates. However, this method has been found to lack specificity because other compounds occurring as residual contaminants, such as those of phenoxy acetic acid herbicides, are able to form the thioindigo, presumably through a reaction in which the phenoxy ether bond is split and the liberated acetic moiety is able to couple with the SH group of thiosalicylic acid by a substitution mechanism. (Author abstract by permission)

75-1213. Sherma, J.; Shafik, T. M. (Chem. Dep., Lafayette Coll., Easton, PA 18042). **A multiclass, multiresidue analytical method for determining pesticide residues in air.** *Arch. Environ. Contam. Toxicol. 3(1): 55-71; 1975.* (23 references)

A multiresidue method for chlorinated, organophosphate and *N*-methyl carbamate insecticides has been developed for use in the National Air Monitoring Program. The method involves partitioning and extracting the pesticides from the ethylene glycol trapping solvent with methylene chloride followed by fractionation and cleanup by elution through a silica gel column. The chlorinated compounds are determined by electron capture GC, phosphate compounds by flame photometric GC, and carbamates by electron capture GC after derivatization with pentafluoropropionic anhydride. Recovery data and limits of detectability are presented for 11 chlorinated, 7 phosphate, and 7 carbamate pesticides at high and low levels. It is expected that the method will be applicable to many other compounds not successfully determined by the present analytical procedure, and that it may be adaptable for the analysis of pesticide residues in foods and other environmental samples. (Author abstract by permission)

75-1214. Shoyama, M.; Miyachi, Y.; Sakakibara, J. (Criminol. Lab., Aichi Prefectural Police Headquarters, Nagoya, Aichi, Japan). **[Colorimetric determination of *N*-methyl carbamate insecticides with 2,6-dibromoquinone chloroimide.]** *Bunseki Kagaku (Anal. Chem.) 24(1): 30-35; 1975.* (12 references) (Japanese)

A method of determining *N*-methylcarbamate insecticides has been developed. The principle involves hydrolyzing the carbamate into the constituent phenol, then reacting the phenol with 2,6-dibromoquinone chloroimide in borate buffer and developing the color, which is determined by colorimetry. The appropriate pH of borate buffer was 8.0 for 2-isopropoxyphenyl *N*-methylcarbamate (propoxur, PHC), and 9.4 for 1-naphthyl *N*-methylcarbamate (carbaryl, NAC), *m*-tolyl *N*-methylcarbamate (MTMC), *o*-isopropylphenyl *N*-methylcarbamate (MIPL), *o-sec*-butylphenyl *N*-methylcarbamate (BPMC, Osbac) and 3,5-xylenyl *N*-methylcarbamate (maqbarl, XMC). After 2 hr of color development the absorbance was determined at 580 nm for NAC, 608 nm for MTMC, 592 nm for MIPC, 593 nm for BPMC, 625 nm for XML, and 591 nm for PHC, respectively. The calibration curves showed a good conformity to Beer's law. As an example, a fermented soybean soap adulterated with 1 mg of each carbamate was described in which the ethyl acetate was washed with borate buffer, partitioned between hexane and acetonitrile, then purified by TLC. The recovery was about 75%.

75-1215. Mann, J. B.; Enos, H. F.; Gonzalez, J.; Thompson, J. F. (Pestic. Toxic Substances Effects Lab., Nat. Environ. Res. Cent., Research Triangle Park, NC 27711). **Development of sampling and analytical procedure for determining hexachlorobenzene and hexachloro-1,3-butadiene in air.** *Environ. Sci. Technol. 8(6): 584-585; 1974.* (4 references)

Chromosorb 101 efficiently trapped vapors of hexachlorobenzene (HCB) and hexachloro-1,3-butadiene (HCBD) from air at a sampling rate of 3 l./min. No loss of efficiency was noted with sampling times of up to 3 hr. Increasing the sampling rate to 10 l./min. for 1 hr decreased the efficiency by 20%. The method as described has a detection limit of 28 ng of hexachlorbenzene per cubic meter of air. (Author abstract reprinted by permission of the American Chemical Society)

75-1216. Herzel, F. (Inst. fuer Wasser-, Boden-, Lufthyg., Bundesgesundheitsamt, Berlin, Germany). **Rueckgewinnung geringer Substanzmengen von der Duennschichtplatte. [Recovery of small amounts of substances from the thin-layer plate.]** *Fresenius' Z. Anal. Chem. 268(2): 126-127; 1974.* (German)

Thin-layer chromatographic preparative techniques often require removal of developed spots from the chromatoplates for subsequent elution. An improved method for this step was developed. A micro-immersion filter was used to draw the loosened sorbent from the plate. Sorbent loss due to suction through the relatively coarse glass frit was always below 1% in the current experiments. Then small quantities of extracting solvent were introduced carefully into the tube end of the filter, and the eluate emerging through the filter surface was collected in a small volumetric tube. Recoveries of dieldrin, lindane, DDT, atrazine, and simazine chromatographed and eluted by this method ranged from 95 to 97% with the first 0.2 ml of solvent and 2.5 to 4.2% with the second 0.2 ml. The mean variation of replicate measurements for the first extraction in the case of dieldrin was 1.3%. The minimal amounts of solvent

required to elute the material from the small filter tube made it possible to increase the detection level for the pesticides by approximately a power of ten.

75-1217. Panzel, H.; Ballschmiter, K. (Abt. Anal. Chem., Univ. Ulm, Ulm, Germany). **Chlorierte Paraffine als Umweltchemikalien. 1. IR- und ^{1}H-NMR-spektroskopische und gas-chromatographische Nachweis- und Bestimmungsmethoden. [Chlorinated paraffins as environmental chemicals. 1. Identification and determination by IR and ^{1}H-NMR spectroscopy and gas chromatography.]** *Fresenius' Z. Anal. Chem. 271(3): 182-191; 1974.* (12 references) (German)

The technical chlorinated paraffins are found to be extremely complex mixtures and analysis of trace amounts is difficult. While IR-absorption spectroscopy only allows a general identification of chlorinated paraffins after extraction using the bands at 1260 and 680 cm^1, ^{1}H-NMR-spectroscopy gives some differentiation of types of these compounds according to chain lengths and degree of chlorination. A method of identification and determination applicable to trace amounts uses reductive dechlorination by sodium-bis(2-methoxyethoxy) aluminium hydride (Vitride) under pressure at 160°C and subsequent gas chromatography of the hydrocarbon mixture formed on 3% Dexsil 300 (temperature program 90–360°C, 10°C per min) with flame ionization detector. The polychlorinated biphenyls and polychlorinated hydrocarbon pesticides, e.g. DDT, are reduced to their parent hydrocarbon and are easily identified as such. (Author abstract by permission)

75-1218. Sigrist, R.; Temperli, A.; Hurter, J.* (Fed. Res. Sta., Biochem. Sect., Waedenswil, Switzerland). **A fluorometric method for the determination of residues of 1-naphthaleneacetamide and 1-napthaleneacetic acid on apples.** *J. Agric. Food Chem. 22(4): 568-571; 1974.* (15 references)

1-Naphthaleneacetamide (NAAamide) and 1-naphthaleneacetic acid (NAA) were applied to apple trees to prevent fruit drop 4 weeks before harvest. Maximum residues detected by fluorescence spectrophotometry, on a whole fruit, fresh weight basis, did not exceed 0.049 ppm for NAAamide and 0.012 ppm for NAA. Compared to the toxicologically permitted amount of 1.5 ppm, the residues are small, but persistent. The sensitivities of the assay for NAAamide and NAA in apple extracts are 0.025 and 0.01 ppm, respectively. The recoveries for both growth regulators are 90-103%. No chromatographic steps are required using the assay procedure. (Author abstract reprinted by permission of the American Chemical Society)

75-1219. Hoskam, E. G.; Van Beek, H. (Central Vet. Inst., Rotterdam, The Netherlands). **Thin layer chromatographic identification of crimidine in animal stomach contents in experimentally induced Castrix poisoning.** *J. Assoc. Offic. Anal. Chem. 57(5): 1226-1227; 1974.* (3 references)

Crimidine (2-chloro-4-dimethylamino-6-methylpyrimidine), the active ingredient of the rodenticide Castrix, is extracted from animal stomach or gizzard contents with chloroform in an alkaline medium. The extract is used for thin layer chromatography on a silica gel or polyamide sheet containing a fluorescent indicator; water-30% ammonia (100+2) or water-methanol-30% ammonia (80+20+2) is the mobile solvent. After drying, crimidine appears under ultraviolet light as a dark spot on a fluorescent background. Amounts of 5 μg crimidine are clearly visible; the purple-red dye present in Castrix kernels remains on the baseline. (Author abstract by permission)

75-1220. Nitsche, I.; Selenka, F.; Ballschmiter, K. (Hyg. Inst., Univ. Mainz, Mainz, Germany). **Zum Metabolismus von Dialkyldithiocarbamaten. I. Mitt. Bestimmung der beim Abbau entstehenden Amine durch Umsetzung mit Isocyanaten und gaschromatographische Identifizierung der gebildeten Harnstoffderivate. [Metabolism of dialkyldithiocarbamates. I. Determination of amines using a reaction with isocyanates followed by gas chromatographic identification of the urea derivatives formed.]** *J. Chromatogr. 94: 65-73; 1974.* (43 references) (German)

N,N'-Di- and *N,N',N'*-trisubstituted ureas, formed by the reaction of amines with isocyanates, e.g. *tert.*-butyl isocyanate or 3-trifluoromethylphenyl isocyanate, are useful derivatives for the gas chromatographic analysis of primary and secondary amines. The separation is carried out at temperatures between 70 and 130° on liquid phases such as silicone OV-101 and silicone OV-17. With nitrogen and electron capture detectors the detection limit is 10^{-10} g. Trace analysis of simple primary and secondary amines is important for the study of the metabolism of dialkyl dithiocarbamate fungicides or urea herbicides. Since secondary amines are considered to be potential precursors of carcinogenic nitrosamines their analysis is also of great importance. (Author abstract by permission)

75-1221. Mallet, V.; Surette, D. P; (Dep. Chem., Univ. Moncton, Moncton, New Brunswick, Canada). **Fluorescence of pesticides by treatment with heat, acid or base.** *J. Chromatogr. 95(2): 243-246; 1974.* (17 references)

A method for detecting naturally fluorescent pesticides on silica gel layers, described in a previous paper (see Abstract no. 73-2770) was extended to additional pesticides. Methabenzthiazuron, naptalam, rotenone, thioquinox, and warfarin, none of which were studied previously, fluoresced upon heat treatment; only rotenone had significant natural fluorescence. The detection limit for methabenzthiazuron under the conditions used is especially good. In most cases

spraying with a strong electrolyte, such as an acid or a base, prior to heat treatment did not markedly increase the limit of detection compared to heat treatment alone; however, the spectra of some substances, e.g., naptalam and thioquinox, were altered. Degradation of the pesticide spots may occur at elevated temperatures, and chemical or physical bonding of the compounds to the silica gel layers may also affect fluorescence intensity. Polarity and water content of the layer are also important, since solvent polarity and pH affect quantum efficiency in solution. Alkali spray reagents (sodium or potassium hydroxide) were useful as fluorescence intensifiers. Acid causes spectral shifts, almost always followed by a decrease in fluorescence intensity. Hydrochloric acid was the most useful acidic spray used, while nitric acid acted as a quencher.

75-1222. Ramsteiner, K. A.; Hoermann, W. D. (CIBA-GEIGY Ltd., Agrochem. Div., Basel, Switzerland). **Coupling high-pressure liquid chromatography with a cholinesterase inhibition AutoAnalyzer for the determination of organophosphate and carbamate insecticide residues.** *J. Chromatogr. 104: 438-442; 1975.* (8 references)

Within the last few years, high-pressure liquid chromatography (HPLC) has become a generally accepted analytical technique. For most purposes, the sensitivity of commercially available detectors is sufficient. For residue analysis, however, only the UV detector has sufficient sensitivity and some degree of specificity. Therefore, this type of detector has been used by several workers dealing with residue determination by HPLC. The fluorescence detector, which would offer high sensitivity, is limited to fluorescent compounds or needs fluorigenic labeling as a preliminary step. Recently, two novel types of detector were described by Juvet and Mowery, but so far nothing is known about their performance. The possibility of coupling a liquid chromatograph with an AutoAnalyzer system sensitive to cholinesterase-inhibiting compounds is shown and some preliminary results obtained with this combination are presented. (Author abstract by permission)

75-1223. Gee, M. G.; Land, D. G.; Robinson, D. (Agric. Res. Council, Food Res. Inst., Norwich, England). **Simultaneous analysis of 2,3,4,6-tetrachloroanisole, pentachloroanisole and the corresponding chlorophenols in biological tissue.** *J. Sci. Food Agric. 25(7): 829-834; 1974.* (18 references)

A method was developed for the analysis of 2,3,4,6-tetrachloro- and pentachloroanisoles and the corresponding chlorophenols in biological extracts. Ethylation followed by separation of the preformed anisoles from the corresponding phenetoles (ethyl phenyl ethers) by gas chromatography using an electron capture detector provides a sensitive method of analysis. The extraction method of Likens and Nickerson, while satisfactory for the chloroanisoles in all samples of chicken tissue investigated, was not adequate for the quantitative recovery of chlorophenols from muscle or fatty tissue. An alternative extraction method, not applicable to chloroanisoles, was satisfactory for muscle but was not suitable for skin or fatty tissue. The limitations on the overall technique arise from the difficulty of achieving quantitative extraction of the chlorophenols; this gives more variability in the results than is desirable.

75-1224. Anonymous. **[Studies on biological tests for pesticide residues.]** *Kyoto-Shi Eisei Kenkyusho Nenpo (Annu. Rep. Kyoto Munic. Inst. Pub. Health) 40: 147; 1974.* (Japanese)

Although there are many problems in the use of biological tests for pesticide residues, these tests yield useful information concerning the insecticidal properties of their degradation products. Soil samples, collected from a rice field after harvest at 3 points where fenthion had been applied and one point where it was not applied, were extracted with acetone. The acetone extract was diluted; first instar larvae of *Culex tritaeniorhynchus* were immersed in it for 24 hr, then the mortality assessed. The soil extracts from treated and untreated soils showed insecticidal properties, suggesting the existence of some insecticidal substance, in contrast to the chemical analytical value. The detection limit for biological assay of pesticide residues was 0.02 ppm. Large-scale use of herbicides such as MO and NIP will apparently result in some residual insecticidal activity.

75-1225. Asaka, S.; Seguchi, K. (Nippon Kayaku Co., Ltd., Murunouchi, Chiyoda-ku, Tokyo, Japan). **[Microanalytical methods for determining methyl bromide residues.]** *Noyaku Kagaku (Pestic. Sci.) 2(3): 107-111; 1974.* (11 references) (Japanese)

Methyl bromide residues in cereals were liberated by Malone's sweep codistillation method, and those in vegetables were liberated by acid reflux with *n*-butanol as a defoaming agent. The liberated methyl bromide was derivatized to *O,O*-diethyl *S*-methyl dithiophosphate with ammonium *O,O*-diethyl dithiophosphate or was derivatized to 2,5-dichlorophenyl methyl sulfide with 2,5-dichlorobenzenethiol. The two derivatives were determined by FTD gas chromatography or by ECD gas chromatography. The determination gave good sensitivity, with a detection limit of 0.005 ppm in cereals and 0.001 ppm in vegetables. It was found that acetone was the most appropriate solvent for the first reaction, and a combination of methanol, acetone, and acetonitrile was usable as solvent in the second reaction.

75-1226. Miura, T. (Mitsui Pharmaceut. Ind. Co., Ltd., Tokyo, Japan). **[Analytical methods and stability of**

pyridafenthion.] *Noyaku Kagaku (Pestic. Sci.) 2(3): 112-116; 1974.* (3 references) (Japanese)

Two methods of determining pyridafenthion, diethyl 2,3-dihydro-3-oxo-2-phenyl-6-pyridazinyl phosphorothioate (an insecticide), were briefly described. After placing one ml of a solution containing about 2 mg of pyridafenthion in a line on a silica gel plate, the solvent was dried in air and the compound was developed upward for about 12 cm with a mixture of chloroform and acetone (8:2). After drying the solvent, the silica plate was irradiated under UV and the part showing dark violet in color (*Rf* about 0.6) was extracted with 50 ml of methanol. The extinction at 322 nm was compared to the calibration curve already prepared with the authentic compound to determine pyridafenthion in the original solution. The average recovery was 99.4%±0.6%. The method of determining pyridafenthion by FID-GC was based on FID-GC of an acetone solution of the compound with di(2-ethylhexyl) phthalate as an internal standard. The peak area of pyridafenthion was compared with that of the phthalate to obtain the analytical value. The average recovery was 99.6%±0.4%.

75-1227. Agric. Chem. Inspect. Stn. (Minist. Agr. and Forestry, Kodaira City, Tokyo, Japan). **[Official methods of inspecting agricultural chemicals. Part 27. ESP (dimethyl ethylsulfinylisopropylthiophosphate) EC and CMP (dimethyl-5(2,5-dichlorophenyl)dithiophosphate) EC.]** *Noyaku Kagaku (Pestic. Sci.) 2(3): 123-125; 1974.* (1 reference) (Japanese)

Official methods of determining the contents of active ingredients in EC formulations of, respectively, dimethyl ethylsulfinyl isopropylthiophosphate (thiometon, called ESP in Japan) and dimethyl *S*-(2,5-dichlorophenyl thiomethyl) dithiophosphate (phencapton, called CMP in Japan) were explained, the methods having become official on July 3, 1973. The method for ESP depends on isolation by TLC developed with a chlorform-acetone-ether mixture, bromination for detecting the spot on TLC, digestion with sulfuric and nitric acids, and colorimetry by the vanado-molybdate method. The result of analysis of this material ranges from 51.73 to 52.25%. The method for CMP depends on isolation by TLC developed with a carbon tetachloride-benzene-toluene mixture, detecting the spot by UV irradiation, digestion with decomposition by sulfuric and nitric acids, and colorimetry by the vanadomolybdate method. Perchloric acid was formerly used for the digestion; however, in view of the possibility of explosion, it was changed to sulfuric and nitric acid.

75-1228. Takeda, A. (Natl. Inst. Hyg. Sci., Minist. Health Welfare, Tokyo, Japan). **[Methods of determining pesticide residues concerning the standards of foods and food additives.]** *Noyaku Kagaku (Pestic. Sci.) 2(3): 128-138; 1974.* (Japanese)

The outline of official methods for determining pesticide residues in foods, some of which were amended in June 1974, was described. The object of the methods is to obtain standard values for pesticide residues; therefore, they are different from those used for determining the residue precisely. The difficulty of establishing official methods relates to the fact that no application history of pesticides is known in the case of commercial goods (vegetables, cereals, etc). The official methods first designated the parts of the goods to be taken for analysis. Current methods of determining organochlorine pesticide residues are described in particular and explained with examples. The methods are complicated by the presence of fat and other pesticides.

75-1229. Langone, J. J.; Van Vunakis, H. (Dep. Biochem., Brandeis Univ., Waltham, MA 02154). **Radioimmunoassay for dieldrin and aldrin.** *Res. Commun. Chem. Pathol. Pharmacol. 10(1): 163-171; 1975.* (16 references)

A radioimmunoassay for dieldrin and aldrin has been developed which can detect picomole levels of either compound. Antibodies to a synthetic carboxyl substituted analog of dieldrin and aldrin were produced in rabbits and the antiserum used to develop the radioimmunoassay technique. The specificity of the antibodies, determined with respect to several other organochlorine insecticides (DDT, 2,4,5-T, 2,4-D, pentachlorophenol, chloranil, chloropicrin, and hexachloroacetone) indicates that most of the binding energy is directed toward the polychlorinated bicyclic ring system. None of the above-mentioned insecticides nor decachlorobiphenyl or lindane, all of which may be found in samples containing dieldrin and aldrin, should interfere with the radioimmunoassay. Endrin inhibits as effectively as dieldrin but should not interfere in the analysis of physiological fluids and tissues.

75-1230. Hellmann, B. (Natl. Inst. Hyg., Warsaw, Poland). **[Determination of malathion and malaoxon in cereals.] Oznaczanie malationu i malaoksonu w produktach zbozowych.** *Rocz. Panstw. Zakl. Hig. 24(2): 175-179; 1973.* (10 references) (Polish)

A method suitable for determination of malathion and its derivative, malaoxon, in flour, rice, and grits is described. The insecticides are extracted from the cereal under examination in a Soxhlet apparatus using chloroform. The extracts are cleaned up using activated charcoal, then the pesticides detected by thin-layer chromatography in the system benzene-ethyl acetate (9:1). Malathion and malaoxon spots were identified enzymatically. The enzyme used was obtained from beef liver, and beta-naphtyl acetate with addition of stable blue served as substrate. The minimum detectable amount of malathion was 0.20-2.0 mg/kg, depending on the type of cereal used, and for malaoxon, 0.1-0.5 mg/kg.

75-1231. Kozlowski, B. (Author address not given). **Wyparka do benzenu i innych rozpuszczalnikow stosowanych przy badaniu pestycydow. [Evaporator for benzene and other solvents used for determination of pesticides.]** *Gaz Woda Tech. Sanit. 48(9): 313; 1974.* (Polish)

More than 100 samples of pesticides dissolved in benzene for gas chromatographic analysis were concentrated in 1973 using the evaporator designed and constructed by the author. The construction of the evaporator is described and schematically depicted. The main part of the evaporator is a 500 ml glass cylinder containing the sample and revolving around its longitudinal axis. The cylinder is partially immersed on an angle in a water bath at a temperature of 20-30°C. The glass stopper of the cylinder is fitted with two glass tubes, one to admit air and the other connected to a suction pump; the pressure inside the cylinder is reduced by ca. 2 cm benzene with respect to atmospheric. About 2 hr of evacuation were required to concentrate the benzene solution of the sample from 200 ml to ca. 5 ml at a bath temperature of 25-30°C. The evaporator can also be used for continuously increasing the density of larger amounts of liquids by adding them in portions through the inlet tube without having to open the cylinder.

75-1232. Kosmatyy, Ye. S.; Bublik, L. I. (Ukr. Sci. Res. Inst. Plant Protect., USSR). **Primeneniye khromatopolyarograficheskogo metoda v analize pestitsidov. [Use of chromatopolarographic technique for pesticide analysis.]** *Ukr. Khim. Zh. 40(12): 1316-1318; 1974.* (6 references) (Russian)

General considerations on the development of chromatopolarographic pesticide residue analysis are presented, and a method is described for the chromatooscillopolarographic determination of heptachlor, heptachlor epoxide, and lindane in plant materials and in soil. After the initial combination of polarography with column or paper chromatography, the analytical method was improved by the combination of thin-layer chromatography and the oscillopolarographic technique. Soil and plant material samples were treated with *n*-hexane for extraction, after which the solvent was expelled by evaporation, and the residue was applied on adsorbent layer, using heptane or *n* the adsorbent together with the residue was scraped off from the undeveloped part and dissolved in the background solution (0.05 *N* solution of tetramethylammonium bromide in 10% ethanol for lindane, and in 40% ethanol for heptachlor and heptachlor epoxide) for the oscillopolarographic quantitative determination of the residues. The sensitivity was 0.001 mg/kg for lindane, and 0.02 mg/kg for heptachlor and heptachlor epoxide at an error of ±5-7%.

75-1233. Kiseleva, N. I. (Lab. Anal. Chem. Pesticides, All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, Plastic Materials, Kiev, USSR). **Opredeleniye ostatochnykh kolichestv betanala (fenmedifama) v sakharnoy svekle. [Determinaton of betanal (phenmedipham) residues in sugar beet.]** *Vop. Pitan. 6: 68-70; 1974.* (4 references) (Russian)

A method for the qualitative determination of betanal (phenmedipham) in sugar beet is described. Following extraction with chloroform, the sample is spotted on a silica gel layer, using a 1:1 mixture of carbon tetrachloride and ether as the solvent system. The chromatographic layer is heated at 180°C for 30-40 min prior to detection of phenmedipham according to diazotization and azotization reactions. While still hot, the chromatographic layer is sprayed with concentrated hydrochloric acid and sodium nitrate in water, and then with 2% solution of δ-naphthylamine in ethanol. Alpha-naphthylamine, α-naphthol, and *N*-naphthylethylenediamine can be used for azotization. The sensitivity amounts to 0.02, 0.04, and 0.02 mg/kg for these respective agents.

75-1234. Kosmatyy, Ye. S.; Bublik, L. I. (Lab. Anal. Chem. Pesticides, Ukrainian Sci. Res. Inst. Plant Protection, Kiev, USSR). **Khromatoostsillopolyarograficheskoye opredeleniye geptakhlora i epoksida geptakhlora v rasteniyakh. [Combined chromatographic and oscillographic polarographic method for the determination of heptachlor and heptachlor epoxide in plants.** *Vop. Pitan. 6:55-57, 1974.* (4 references) (Russian)

Qualitative thin-layer chromatographic and quantitative oscillopolarographic methods for the determination of heptachlor and heptachlor epoxide residues in plant material are described. Following extraction with hexane, heptachlor, and heptachlor epoxide are separated and identified on a silica gel-alumina layer, using heptane as solvent, and a 0.1% solution of diphenylamine in acetone as a visualizing reagent. The spots are eluted for quantitative determination by the oscillopolarographic method, using a dropping mercury electrode. The sensitivity of the qualitative determination is 0.4 μg/ml solvent.

See also **75-1010**

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